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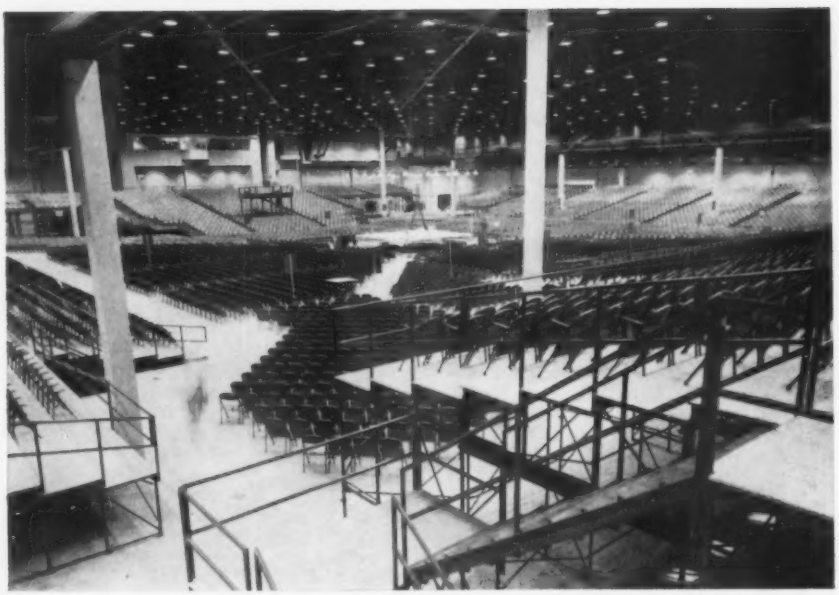

Wiring the South's largest exhibition hall—page 22

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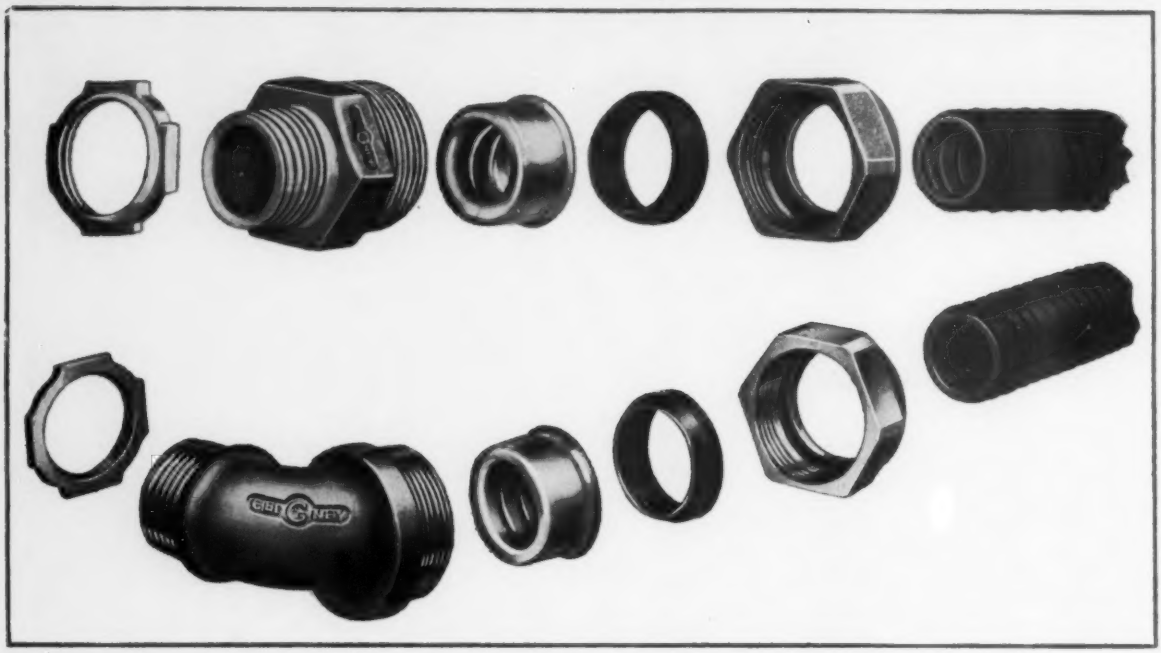

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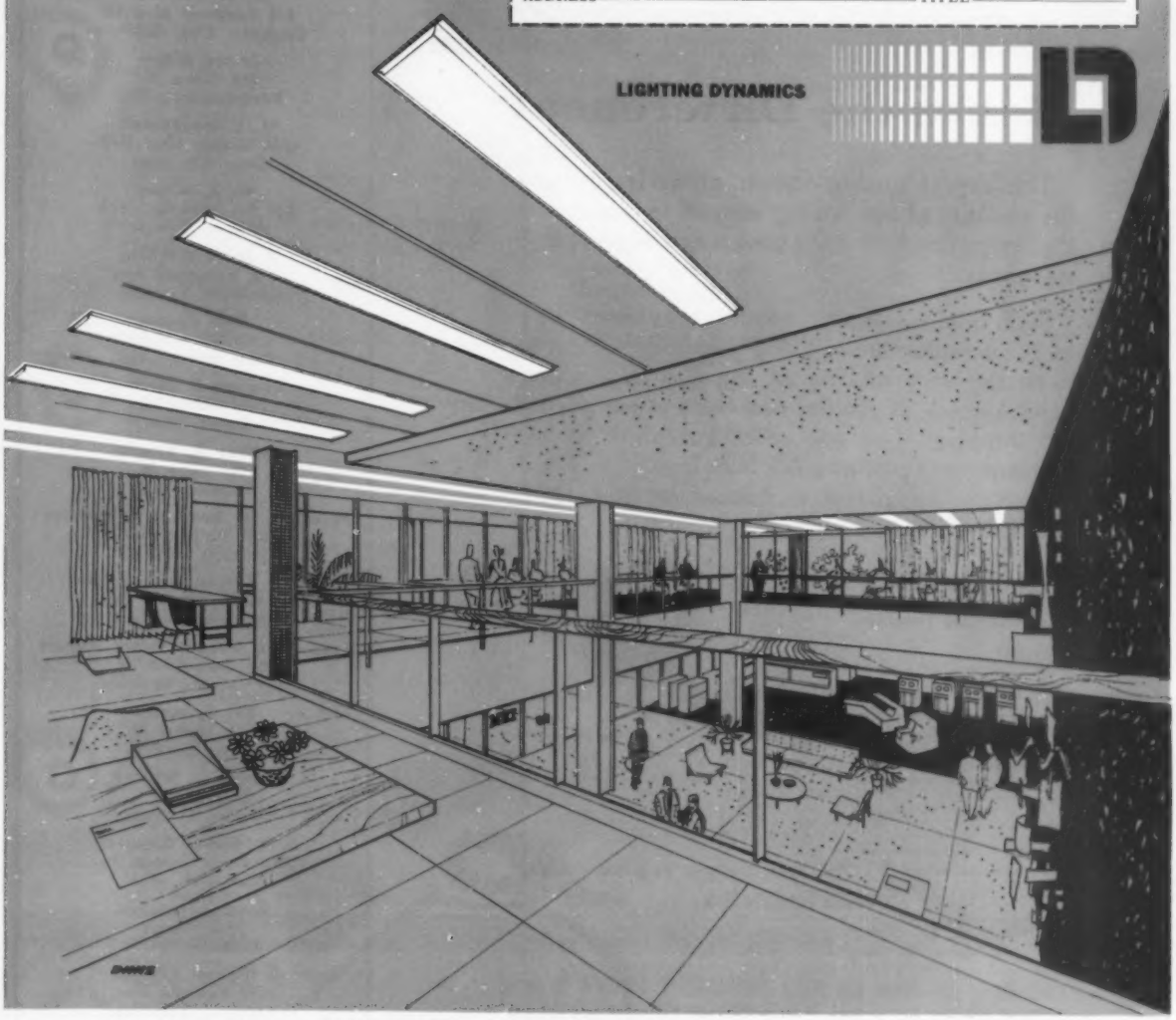

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Economic comment

by J. Whitney Bunting, Ph.D.
Contributing Economics Editor

Savings and the economic scene

A confused area of economic thinking today is that of savings and its impact upon the nation's economic health. The American people are now saving at a phenomenally high rate and, to some observers, are strengthening their financial safeguards against financial adversity.

How much of the present rate of saving is forced by uncertainty and fear of possible economic reversals is difficult to determine. However, many people do sincerely believe in building a degree of financial protection for retirement or for a "rainy day." This is, of course, a highly commendable objective for anyone.

On the other hand, there may be other savings objectives that may or may not be as socially or economically acceptable as the reason just given. Moreover, the results upon the national economic scene may be far different in the final analysis.

A large part of the problem of savings lies in the public attitude toward them. For example, if such savings are to be held through normal investment opportunities for retirement or for later emergency use, then they occupy a central point of significance in the supply of new capital for business development and expansion.

Since industry is constantly searching for new capital funds with which to improve its ability to produce more and better goods, such savings tend to promote the ability of industry to achieve its goals. In addition, it increases the ability of industry to develop new products and processes for the satisfaction of consumer wants and desires.

Dr. Bunting is a well-known economist and educator having special knowledge of the South.

Forced savings have no lasting impact

On the other hand, if the savings are "forced" upon the saver by his belief that prices are perhaps too high, or because quality and value of merchandise may be too low in reference to the expenditure of money, then the result is only a temporary restriction of purchasing power. The funds thus saved will shortly find themselves back in the consumer market when the temper of the saver has changed. Such savings, in general, have no lasting impact upon industrial demands for new capital formation.

The major question in the field of consumer savings, it would appear, lies in the willingness of the prospective consumer to part with such savings when a good bargain appears. Although it is certainly a good economic sign to see savings at unusually high levels, one must constantly remember that they represent claims on consumer goods. Thus, a rate of savings at an abnormally high level for a protracted period of time can potentially cause expansion of productive capacity or a decidedly high inventory situation.

Consequently, now that consumers have the ability to buy, backed up with unusually strong purchasing power, it is important that they be convinced that quality and service are inherent in all products currently offered for sale. This requires an honest and sincere effort on the part of producers and distributors alike to not only express this fact in their selling messages but also ensure that promises made are fulfilled.

It might be well to recognize one very important problem in the economic health reports of the nation. In spite of the 1957-58 cutbacks in plant and equipment expenditures by many industrial concerns, this country is still faced with excess production capacity.

Manufacturing capacity ahead of demand?

Although the productivity figures for the last half of 1958 showed a strong resurgence from the depths reached in the second quarter of the year, the continued capacity growth of manufacturing industries far outstripped actual production results.

During the past five years there has been a steady growth in the ability of the nation's industries to produce more goods for all types of consumers. This has been occasioned not only by increased production facilities but also by new advances in manufacturing technology and by new and automated equipment and processes. At no time during this period has the capacity to produce been reached by actual production.

Thus, there is every reason to believe that the economy is not operating at its most efficient level nor is the nation reaping full benefit from the productive facilities available. Considerable headway has been lost during the year 1958, and it will be of great interest to economic observers to see if the trend can be changed in 1959.

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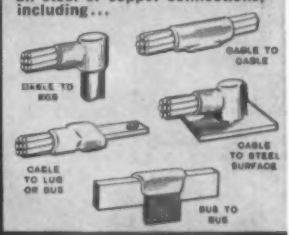

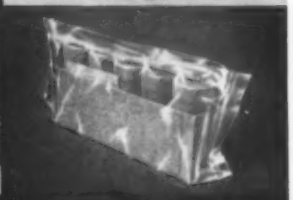

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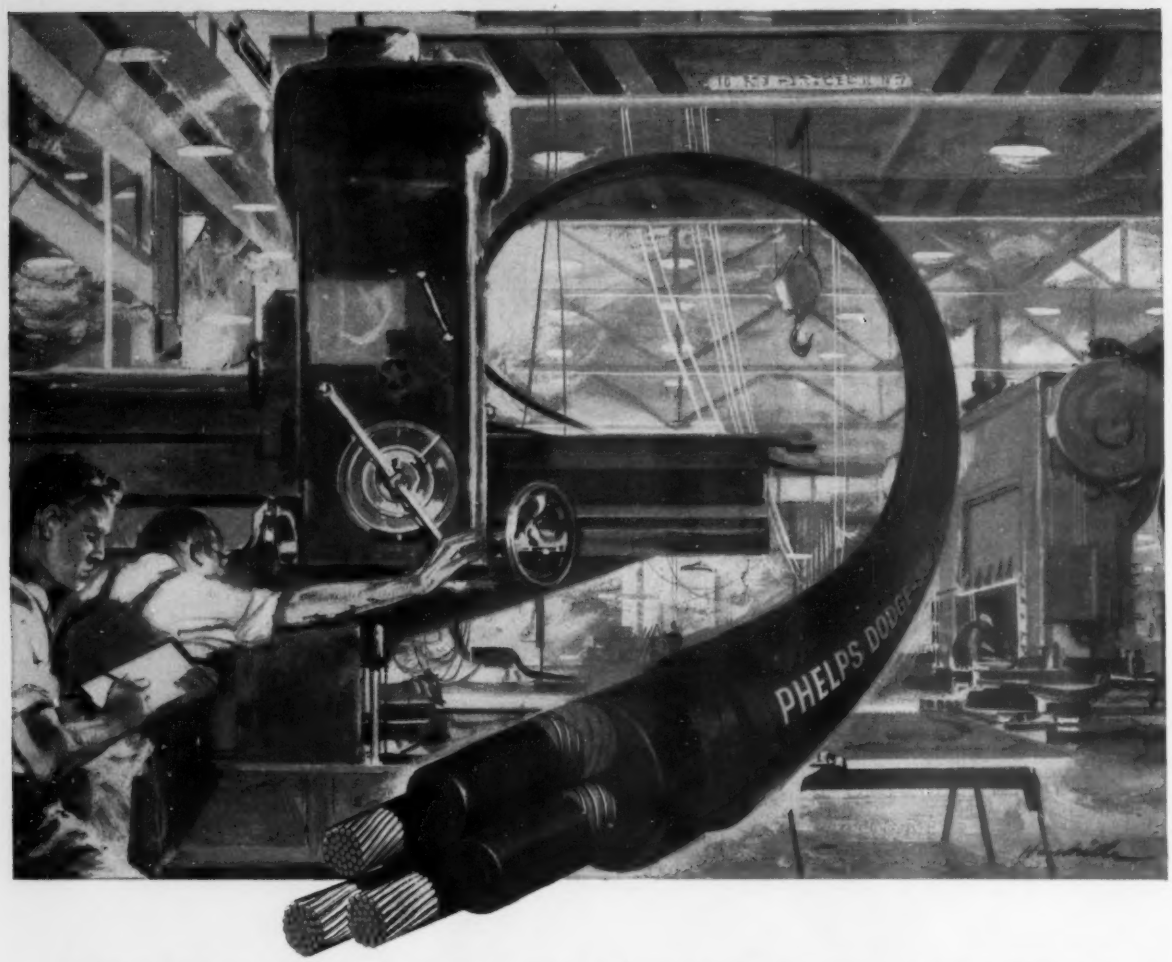

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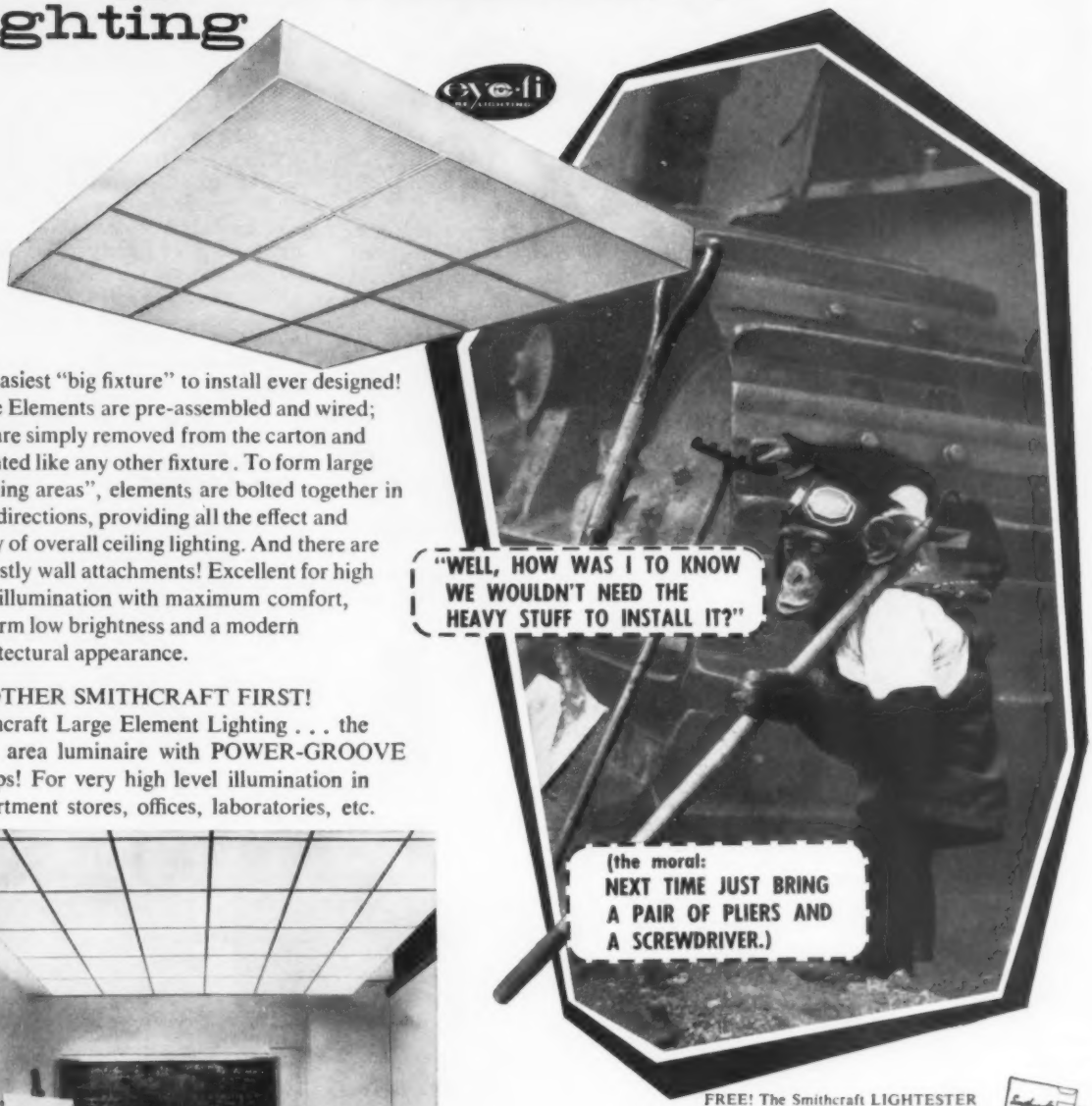
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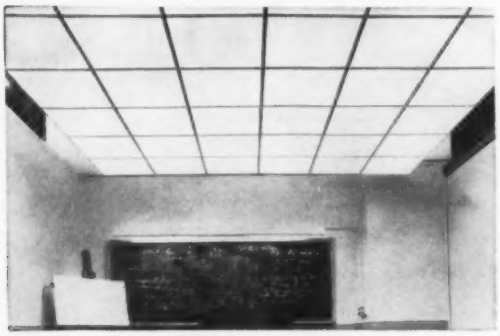

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Washington report

By Jack James

Digest of Washington news of special interest to the electrical industry

Recession causes apprentice decline

FOURTEEN per cent fewer electrician apprentices are learning the trade today in comparison with a decade ago, the U. S. Labor Department revealed last month.

To find out why the number of electrical apprentices had dropped from 19,500 at the beginning of 1949 to 16,854 last June this writer asked the Bureau of Apprenticeship for an explanation. Here is what has been happening:

After World War II, veterans took advantage of the GI Bill to apprentice, and when they became journeymen at the end of the 1940's, the numbers of apprentices fell off.

Then because of the Korean War, youths who might have become apprentices entered the armed services instead. After Korea, industry and contractors gradually began training more apprentices until the 1957-'58 recession. Then apprenticeship training dropped off again.

"Dropping apprentices isn't sensible," a high official of the Bureau observed. "We know we are going to need vastly more skilled manpower in the immediate future. The construction industry, particularly electrical construction, doesn't even have enough apprentices to replace the journeymen who retire or die."

The Bureau's statistics nevertheless show that this loss of apprentices in the recession was general. On Jan. 1, 1957, before the recession began, there were 188,137 apprentices training in 89 crafts. The latest figure shows that as of June 30 last year there were but 178,736.

The real loss might be even greater than the figures indicate. But for the recession the number of apprentices probably would have risen, rather than declined.

Over the long run, and with the return of prosperity, the Bureau of Apprenticeship believes that electrical contractors will return to training more and more apprentices. The Bureau observes: "Apprenticeship has been tested and improved on the hard anvil of time. It has been with us 4,000 years. It is the only way to train craftsmen."

Here are the annual figures on the numbers of electrician apprentices:

Jan. 1, 1949	19,500
June 1, 1950	15,787
Jan. 1, 1952	11,410
Jan. 1, 1953	13,877
Jan. 1, 1954	15,121
Jan. 1, 1955	14,802
Jan. 1, 1956	17,022
Jan. 1, 1957	18,679
Jan. 1, 1958	17,399
June 30, 1958	16,854

* * *

Hiring hall standards questioned by IBEW

NEW hiring hall regulations, as readers of the previous column remember, require that employees be referred to jobs without discrimination because of union membership; that employers have the right to reject any applicant; and that the hiring rules be posted at the hall.

Now Louis Sherman, general counsel of the International Brotherhood of Electrical Workers has raised questions about these new National Labor Relations Board standards.

Sherman wants to know:

Suppose the employer and the union have agreed on a seniority system in hiring. Shouldn't an employer have to show cause for rejecting a job applicant under such a system?

What is going to happen to the traditional building trades practice of having unions qualify workers for journeymen status, and of giving priority in referrals to qualified men?

What is going to happen to the special priorities given to key craftsmen on certain jobs and the practice in some crafts of providing that a certain proportion of old journeymen be employed?

Sherman raised these questions in a recent issue of the *Georgetown Law Journal.*

As yet the Labor Board has not answered.

* * *

Electricians' wages climbed in 1958

AVERAGE hourly wages for union electricians climbed 17.8 cents during 1958, the Bureau of Labor Statistics has announced. Average rate is $3.71 an hour, and the range is $2.63-$4.35 an hour. The figures are based upon a survey of wages in 100 cities. Highest rate is at Pittsburgh, Pa.; lowest at Raleigh, N. C.

The Tennessee Valley Authority that sprawls through Alabama, Tennessee, Virginia, and Kentucky has raised its pay rates for electricians by 20 cents an hour. The rate is now $3.45 an hour.

* * *

Construction gain sets January record

NEW construction begun in January set a record for the month, the Departments of Labor and Commerce have announced. Dollar value was ten per cent above that of January last year, previous record high for the month.

Both private and public construction expenditures continued at a high level of three billion, seven hundred million dollars. The amount actually was a drop from the four billion worth of construction started in December, but the decline was wholly seasonal.

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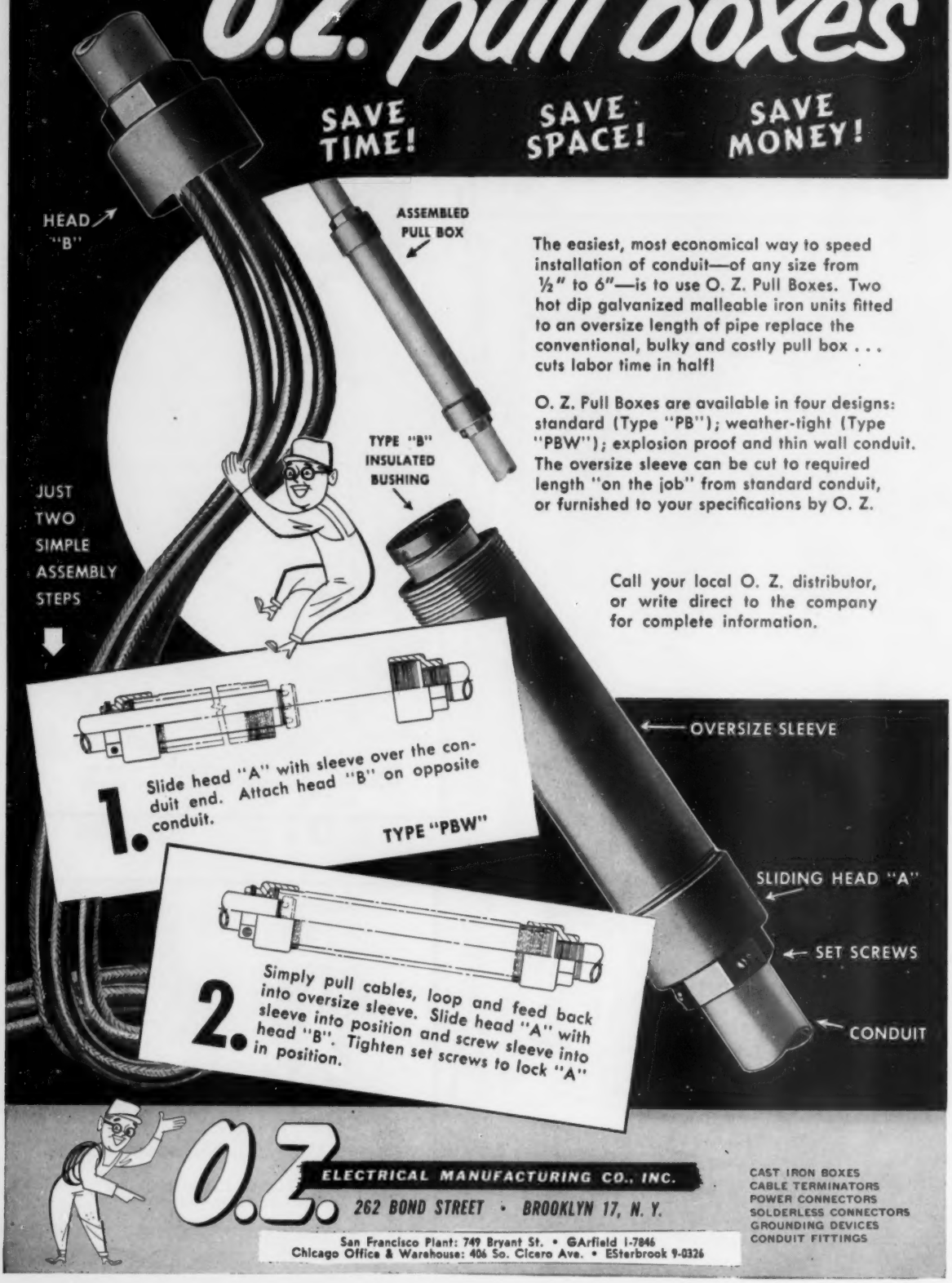
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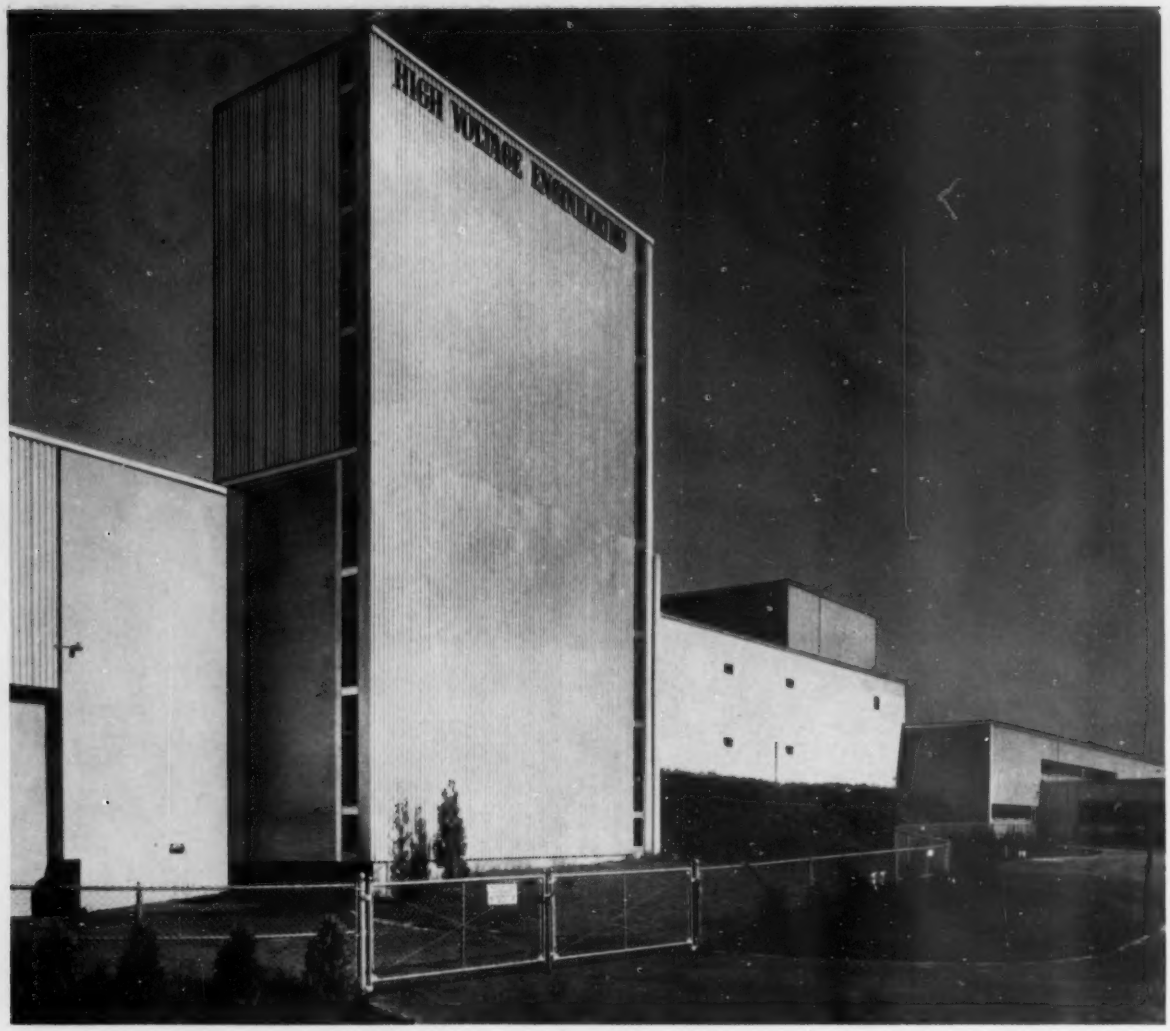


Partial View of the new plant on a 50-acre tract.

Architect: Carleton R. Richmond, Jr.; *Supervising engineers:* Stressenger, Adams, Maguire & Reidy; *General contractor:* Aberthaw Construction Co.; *Electrical contractor:* M. B. Foster Electric Co.

Another electrical manufacturer selected SORGEL dry-type transformers

for the operation of their plant

The HIGH VOLTAGE ENGINEERING COMPANY, in Burlington, Mass., the world's largest manufacturer of atom smashers, learned about the advantages of SORGEL dry-type transformers during an application with their product, which, on account of its nature, required the *best* transformers.

Being in a position to judge the quality of the transformers, they, like so many other electrical manufacturers, also selected SORGEL dry-type transformers for their own plant.

Complete line of dry-type transformers for every purpose

¼ Kva to 10,000 Kva — 120 to 15,000 volts

Quietest operation and high efficiency

●

Also special transformers, saturable reactors, and substations

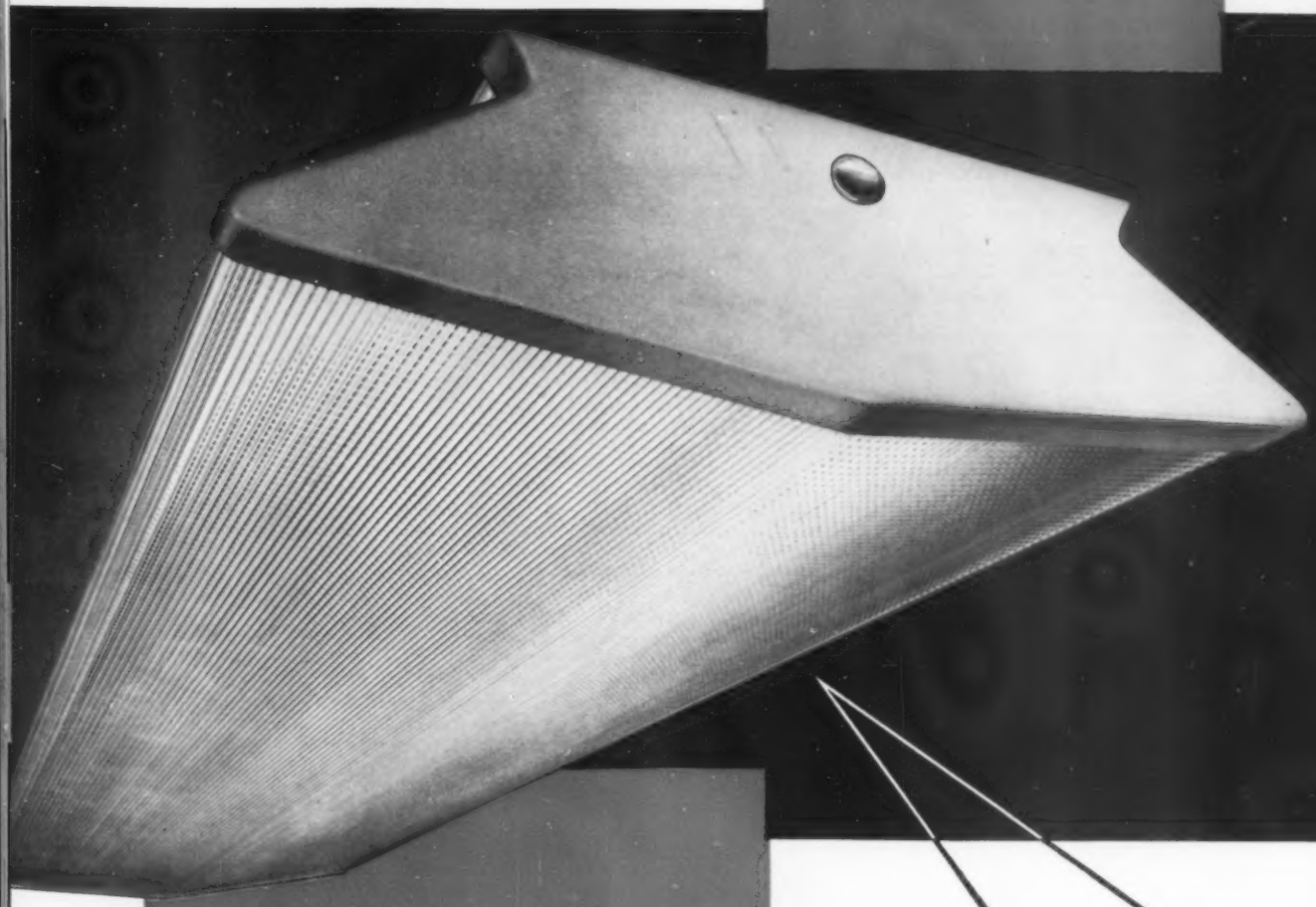
Sales engineers in principal cities

SORGEL ELECTRIC CO., 835 West National Avenue, Milwaukee 4, Wisconsin

Over 40 years' experience in the development, manufacturing and application of transformers

More Fluorescent Lighting Jobs at *Full* Profit . . .

SABRE by miller



When you select and install the *new* SABRE by Miller you're able to get a bigger share of store, office, and school lighting jobs at *full* profit. Because with Sabre you're offering a fixture that's *really* different . . . that has distinctive styling and outstanding performance . . . is quickly and easily installed, and is *competitively priced.*

And, your customers will like and benefit from Sabre's unique and exciting features such as: the sweeping lines and shallow depth of "Flite-Line" Styling which enhance the appearance of any interior . . . the *one-piece* wrap-around refractor of prismatic crystal-clear plastic which provides extra "sparkle" and comfort, and is easily removed for relamping and cleaning. And, of course, *they'll* find Sabre's modest price attractive, too!

So ask your *Miller Distributor* to show you this exciting new fixture, today. Pick up a sample for demonstration purposes. Be ready to cash in on the demand being created now by Miller through national advertising and strong promotion to users in your area. And, for complete catalog information on Sabre, write Dept. 958-C.

SABRE (Trademark)

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SINCE 1844

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CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

LIGHTING PANELBOARDS — A 4-page descriptive folder featuring a line of plug fuse and toggle switch panelboards for lighting control circuits is now available from Frank Adam Co., 3650 Windsor Pl., St. Louis, Mo. The folder includes box sizes, details of construction, wiring gutters, special features, and catalog numbers.
Write in No. D100 on card, Pg. 19

PROPELLER FANS — Buffalo Forge Co., P. O. Box 985, Buffalo 5, N. Y., announces the availability of literature describing their line of heavy-duty propeller fans and related "package" units. Two illustrated bulletins give detailed information on sizes, capacities, and construction of the entire line.
Write in No. D101 on card, Pg. 19

CIRCUIT PROTECTION — A 24-page illustrated handbook contains suggestions for selecting the right kind of protection for electric circuits, motors, appliances and apparatus. Includes motor wiring diagrams and a complete list showing proper size fuses to use. Available from Bussman Mfg. Co., University at Jefferson, St. Louis 7, Mo.
Write in No. D102 on card, Pg. 19

ELECTRIC HEATERS — A new catalog describing their line of electric heaters is available from Hunter Division of Robbins & Myers, Inc., Memphis 14, Tenn. The bulletin, Form No. EH-112, contains the design features and specifications of R&M-Hunter automatic baseboard, convection baseboard, wall, portable, and bathroom heaters.
Write in No. D103 on card, Pg. 19

MODULAR LIGHTING—A twelve-page folder describing and illustrating their line of surfaced and recessed fluorescent modular fixtures is announced by Moe Light of Thomas Industries Inc., Lighting Division, 410 S. Third St., Louisville, Ky. Complete coefficient of utilization and candlepower distribution tables are included for each set of fixtures.
Write in No. D104 on card, Pg. 19

MANHOLE HEATER—A four-page brochure issued by Morrison-Pelsue Co., 2256 S. Delaware S., Denver 23, Col., describes and illustrates applications of the MoPeCo Ventilating Heater available in several models, electrical or gasoline engine powered.
Write in No. D105 on card, Pg. 19

LIGHTING FIXTURES — An illustrated 44-page price list is now available from EJS Lighting Corp., 921 East Pico Blvd., Los Angeles 21, Calif. In convenient condensed form, this price book includes a sketch of each fixture as well as catalog number, number of lights, recommended wattage, description, standard package quantity, weight, list price and dimensional data.
Write in No. D106 on card, Pg. 19

LIGHTING EQUIPMENT—Recently announced by Steber Mfg. Co., Dept. R-1, Broadview, Ill., a new condensed catalog No. CTC-3, and trade price schedule contains illustrations and brief descriptions of the complete Steber line. New products included are: two new high bay series, 24-inch 1,000-watt, mercury floodlights; fluorescent area floodlights; RLM reflectors; and a full range of counter balanced hinged poles.
Write in No. D107 on card, Pg. 19

HYDRAULIC POWER TOOLS—A new bulletin describing their two-speed, fast-approach portable power unit for hydraulic tools such as conduit benders, cable pullers, and pipe pushers is announced by Greenlee Tool Co., Rockford, Ill.
Write in No. D108 on card, Pg. 19

CONDUIT WIREHOLDERS — A new information sheet describing their line of all-purpose conduit wireholders is now available from Knox Porcelain Corp., P. O. Box 2031, Knoxville, Tenn. The illustrated sheet gives installation information, design features, and specifications.
Write in No. D109 on card, Pg. 19

LAMP GUIDES—Sylvania Lighting Products, 60 Boston St., Salem, Mass., has made available three lamp guides containing general information, technical data, and catalog listings on their lines of fluorescent lamps, incandescent lamps, and mercury lamps.
Write in No. D110 on card, Pg. 19

PLUGS, RECEPTACLES — Two basic designs — explosion-proof and weatherproof—of Killark plugs and receptacles are fully covered in a new catalog section. This line offers many advantageous features, and is available in many styles and sizes to fit various boxes. Killark Electric Mfg. Co., Easton and Vandeventer Ave., St. Louis 13, Mo.
Write in No. D111 on card, Pg. 19

ELECTRICAL DEVICES — Two publications, the pocket Federalog 111-PR and Bulletin 3-230, have been made available by Federal Pacific Electric Co. Complete details concerning circuit breakers, panelboards, fusible service equipment, safety switches, industrial motor control and lighting and power panelboards are contained in the 32-page pocket-sized catalog. The 8-page bulletin is devoted to the company's new line of QMQB fusible switches and panelboards.
Write in No. D112 on card, Pg. 19

BUILT-IN HEATERS—Thermador Electrical Manufacturing Co., 5119 District Blvd., Los Angeles 22, Calif., has announced the availability of three new catalog sheets on their line of built-in electric heaters. The heaters described are their portable radiant-fan heater, electric ceiling heater, and baseboard electric heater.
Write in No. D113 on card, Pg. 19

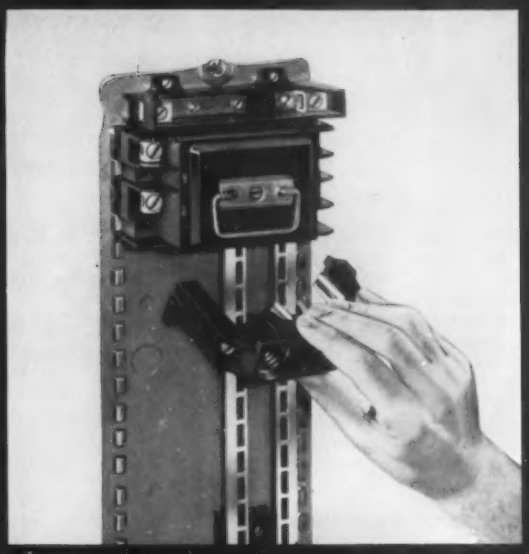
PRICE SERVICE—Specimen copies of the National Price Service price books are available on request from Henderson-Hazel Corp., 13601 Euclid Ave., Cleveland 12, Ohio. Please indicate whether you are a contractor or wholesaler. Each specimen includes a complete index, a representative sampling of completely illustrated price sheets, and information of special interest to those concerned with pricing electrical construction materials.
Write in No. D114 on card, Pg. 19

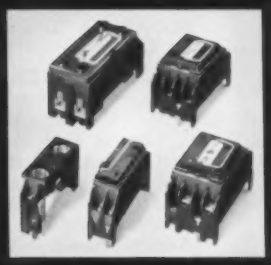
FLUORESCENT FIXTURES—The new Miller Sabre fluorescent fixture is illustrated in the Sabre catalog, page 13, published by The Miller Company, Meriden, Conn. This page points out application, construction details, and dimensional, illumination, and installation data.
Write in No. D115 on card, Pg. 19

CABLE SUPPORTING TRAYS—The Globe Co., 4000 South Princeton Ave., Chicago 9, Ill., has made available a new catalog on their line of cable supporting tray systems and accessories. The catalog contains information on design features, specifications, and installation.
Write in No. D116 on card, Pg. 19

Another Engineering Achievement

BIG NEWS!
ALL-NEW
STAB-IN
fusible service equipment





10 enclosures... 5 stab-in units
replace 208 devices... meet all
requirements through 200 amps!

For the first time! Uncompromised flexibility—because there are no fixed circuits. Now you can tailor every installation to your exact requirements. Just stab-in circuits where you want them—when you want them! CHECK THESE FEATURES...

ENCLOSURES

- ✔ Only 10 enclosures: 5 split bus, 5 parallel.
- ✔ Dual rated for service entrance and load center applications.
- ✔ Exclusive "picture frame" combination flush/surface feature.
- ✔ Exclusive sequence bussing.
- ✔ Step-type insulated neutrals.
- ✔ Narrow width—shallow depth.
- ✔ UL approved for both copper and aluminum cable.

STAB-IN UNITS

- ✔ Only 5 stab-in units: 30 amp Twin Plug-Fuse Unit, 30 amp Cartridge-fuse Pullout, 60 amp Main Cartridge-fuse Pullout, 60 amp Branch Cartridge-fuse Pullout, 100 amp Cartridge-fuse Pullout.
- ✔ Exclusive "millions-tested" four-way stabs.
- ✔ Unique locking clip insures non-interchangeability. Defeatable by qualified contractor.
- ✔ Compact new space-saving 30 and 100 amp pullout units.

Now you can afford to carry your own stock and meet all your fusible requirements through 200 amps. Get the proof! Write for Bulletin 1-215, Federal Pacific Electric Company, General Offices: Dept. 322, Newark 1, New Jersey.

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**

The Best in Electrical Distribution and Control Equipment

CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

CENTRIFUGAL ROOF VENTILATORS—An 8-page, two-color folder (SDA-220) giving construction features, performance data, dimensions and recommended specifications for the new Centrifugal Roof Ventilator manufactured by The Peerless Electric Company, Warren, Ohio. Other important Peerless Fan and Blower products and a list of Peerless sales representatives are also included.
Write in No. D117 on card, Pg. 19

VENTILATING EQUIPMENT — "Power-Vent Ventilating Equipment" is a new catalog describing a large and complete line of ventilating fans, range hoods, and Therm-O-Lite, the Weather-light-air circulator from Progress Manufacturing Co., Castor Avenue and Tulip Street, Philadelphia 34, Pa.
Write in No. D118 on card, Pg. 19

CONDUIT FITTINGS—Bridgeport Fittings, Inc., 209 Center St., Bridgeport, Conn., offers a twenty-six page catalog describing their line of conduit, bushings, lock nuts, couplings, nipples, supports, connectors, and other fittings. Size, weight, and packing details are included.
Write in No. D119 on card, Pg. 19

SPACE HEATING GUIDE—Cavalier Corp., Chattanooga 2, Tenn., has prepared a Guide for Calculations on Electric Space Heating. It is based on study of several thousand installations of electric heat and is a handy reference for calculating electric heating requirements and estimating operating costs. The booklet contains discussion, charts and floor plan examples.
Write in No. D120 on card, Pg. 19

NEOPRENE RUBBER COATING—Descriptive literature and application data are available from Charleston Rubber Co., Stark Industrial Park, Charleston, S. C., on their new product Charcote, a durable neoprene rubber coating, which gives protection against corrosive fumes, weathering, abrasion, and other hazards.
Write in No. D121 on card, Pg. 19

NON-METALLIC FIXTURES — A new complete condensed catalog with list prices covering their complete line of non-metallic lighting fixtures is now available from Union Insulating Co., P. O. Box 351, Parkersburg, W. Va.
Write in No. D122 on card, Pg. 19

CONNECTOR BULLETINS — Six new bulletins have been released by Ilsco Corp., 4730 Madison Rd., Cincinnati, Ohio. They cover the Ilsco line of solderless connectors, special connectors, lugs, neutral bars, crimp lugs, and the Ilsco Lok-A-Blok. The bulletins include descriptive material, dimensions, and packaging data.
Write in No. D123 on card, Pg. 19

TRENCH TOOLS — A new 6-page bulletin gives complete operating specifications, dimensions, and recommended uses for a new line of trench drills from Salem Tool Co., Salem, Ohio. The three models shown will handle augers up to 6 feet long and 24 inches in diameter. The drills bore holes and push pipe simultaneously.
Write in No. D124 on card, Pg. 19

INDUSTRIAL LIGHTING — A four-page catalog insert is now available from the Multi Electric Mfg. Co., Inc., 4223-43 West Lake St., Chicago 24, Ill. The leaflet describes Multi's line of lighting equipment and wiring devices, which include floodlights, vaporproof fixtures, and fluorescent and incandescent fixtures.
Write in No. D125 on card, Pg. 19

TROFFER CATALOG—A 36-page catalog, with complete information on their newly re-designed architectural troffers has been released by Smithcraft Lighting Division, Chelsea, Mass. Divided into sections for selection of lighting units, the catalog gives complete illustrations and data for 1 and 2 foot troffers in all types of ceiling construction. Also included in the catalog is information on ceiling lighting patterns, shielding designs, lighting techniques and applications.
Write in No. D126 on card, Pg. 19

ELECTRICAL TAPES — Twelve pages of specifications and application data make up an attractive booklet on Dutch Brand Electrical Tapes. Plastic, friction, and rubber tapes, as well as a vinyl tape made in nine different colors, are available from Dutch Brand Division, Johns-Manville, 7800 So. Woodlawn Ave., Chicago 19, Ill.
Write in No. D127 on card, Pg. 19

POWER-STRUT CHANNEL — Three new bulletins have been issued containing specifications and application data on Power-Strut channels and related devices manufactured by Power-Strut, Inc., Framingham, Mass. No. 550 describes its use as surface raceway and lighting support; No. 560, electrical cable and duct supports; 580, movable Power-Strut walls.
Write in No. D128 on card, Pg. 19

LIGHTING FIXTURES — Eastern presents their most complete catalog, 32 pages of engineered lighting data, including a variety of fixtures for all architectural, commercial and industrial applications. Eastern Fixture Co., Inc., 170 Vernon St., Boston 20, Mass.
Write in No. D129 on card, Pg. 19

TRENCHER — A catalog sheet on the Pow-R-Spade trencher manufactured by Stampings, Inc., Davenport, Iowa, is now available. The labor-saving machine digs a 3 in. wide trench from 1 in. to 24 in. deep, or 4 in. wide, 18 in. deep.
Write in No. D130 on card, Pg. 19

LIGHTING FIXTURES—Progress Manufacturing Co., Castor Avenue and Tulip Street, Philadelphia 34, Pa., announces the publication of two new lighting catalogs. "Lighting by Progress", a 52-page booklet, describes their line of residential fixtures. "Home Lighting by Minute Mount" is a 12-page bulletin illustrating new ideas in budget lighting.
Write in No. D131 on card, Pg. 19

MOTOR CONTACTORS—For control of large motors, primary switching of induction furnace transformers, and other high voltage applications, **Allis Chalmers Manufacturing Co.**, Milwaukee 1, Wis., has developed the **high voltage air-break contactors** (type 256A) which are described in a bulletin issued by the company.
Write in No. D132 on card, Pg. 19

ELECTRICAL DUCTS — A brochure is now available from John-Manville, 22 East 40th St., New York 16, N. Y., describing their line of Transite electrical ducts. The two-color, 11-page, illustrated bulletin contains information on composition, methods of manufacture, applications, costs, and installation. Also included are shipping weights and dimensions of Transite conduit and Korduct.
Write in No. D133 on card, Pg. 19

INFORMATION CENTER

BOOKLETS • NEW PRODUCTS • ADVERTISEMENTS

Help yourself to free literature and more details on any product mentioned in this issue.

Instead of writing a dozen different manufacturers for free literature and more information on products, tools, or services, just insert on the cards below the appropriate key numbers of the items in which you are interested. These cards may be used to get information on products mentioned in the following departments (see Contents Page for page number):

Catalogs and Bulletins — New Electrical Products
New Utility Equipment — Manufacturers' Literature

Be sure to print or write legibly your name and address—drop it in the nearest mail box and

ES pays the postage!

MARCH, 1959

Send free information on these NEW PRODUCTS and/or services (fill in key numbers):

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My Name _____ Position_____
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Address (number and street) _____
City _____ Zone_____ State_____

MARCH, 1959

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Company_____ Page_____ Company_____ Page_____

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My Company's Name _____
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City _____ Zone_____ State_____

These cards can help you get valuable information

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BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 882, SEC. 34.9, P. L. & R., ATLANTA, GA.

Electrical South

806 PEACHTREE ST., N. E.

ATLANTA 8, GEORGIA

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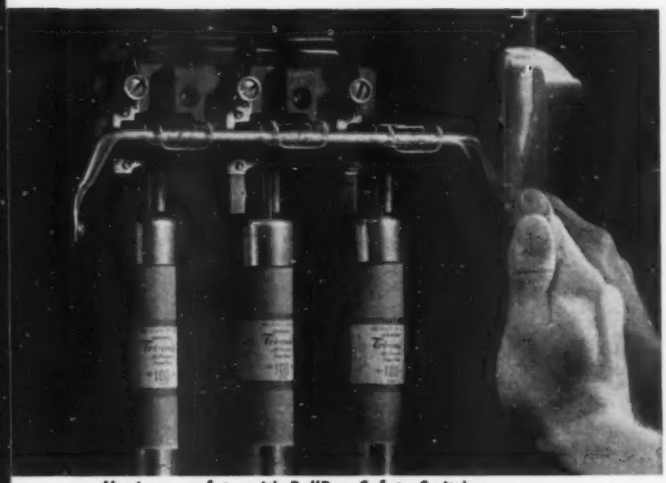
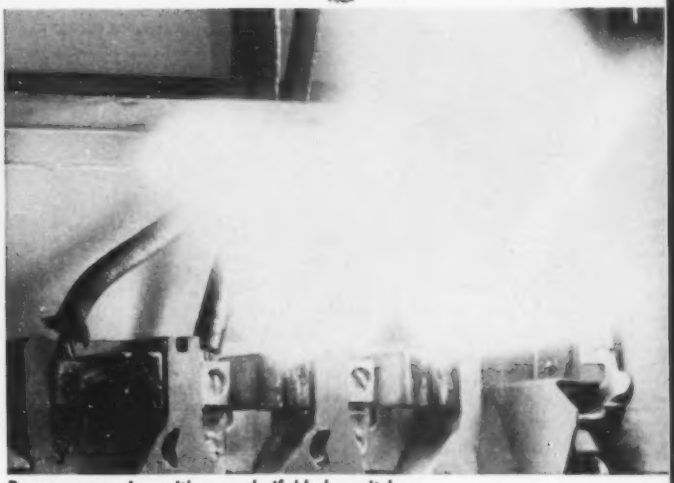
FOR SAFETY'S SAKE, BUY VACU-BREAK

With BullDog's exclusive clamped-pressure switching contacts



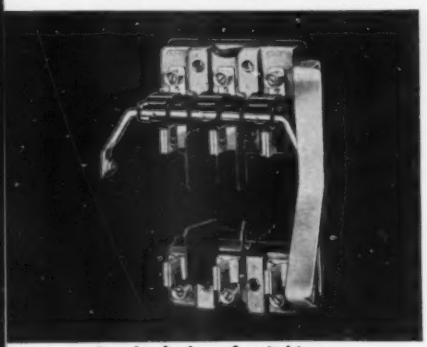
Maximum safety with BullDog Safety Switches

Arcs are smothered before they can cause fire hazard or damage to the switch because contacts are housed inside compact Vacu-Break* chambers. Pitting and burning of contacts are reduced to an absolute minimum—maintenance is virtually eliminated.



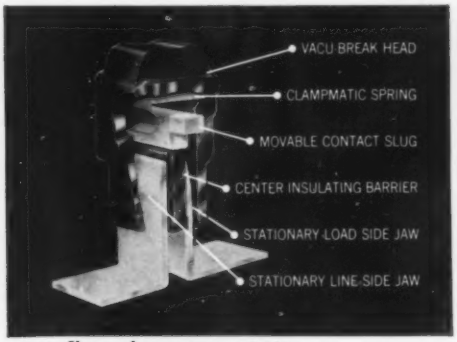
Dangerous arcing with open knifeblade switches

Unconfined flash explosion occurs, burning and pitting blades. Fire hazard and frequent maintenance are the result. These are unretouched photographs of 100 amp, 600 volt switches, operating under 90 ampere, 440 volt load with 40% to 50% power factor.



Simple, foolproof switching

Vacu-Break heads are *directly* connected to the switch handle. No toggles, triggers or springs to fail. No danger of switching failure. Positive, safe switching *every time* for a lifetime.



Clamped-pressure contacts

This close-up shows movable contact slug and Clampmatic* spring assembly inside Vacu-Break chamber. The Clampmatic assembly assures clamped-pressure contacts, speeds "break", increases switch life.

Withstand 100,000 amp fault current

BullDog Vacu-Break Switches—Master and Junior—will withstand 100,000 amp short circuit current when equipped with current-limiting Amp-Traps**. Play it safe—recommend and buy BullDog Vacu-Break!

© BEPCO

*Vacu-Break and Clampmatic are registered trademarks of the BullDog Electric Products Division.

**Amp-Trap is a registered trademark of the Chase-Shawmut Company.

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

Consult the following Southern representatives:

Wilson Electrical Equipment Co.
2930 Commerce St., P.O. Box 1725
Houston, Texas

Wilson Electrical Equipment Co.
101 E. Maple Street
San Antonio, Texas

Standard Electric Mfg. Company
2401 Federal St., P.O. Box 1138
Dallas 1, Texas

Walker Electrical Co., Inc.
125 Bennett St., N. W., P. O. Box 8, Station D
Atlanta, Georgia

Multi-purpose electrical system

By Hal M. Newsome

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors ✔
- Industrial Engineers
- Consulting Engineers ✔

◆ THE RESORT CITY of Miami Beach needed a new modern exhibition building, large enough and versatile enough to handle any kind or size of national or regional convention or big trade meeting. Such a building in turn called for a large-capacity, completely - flexible, multi - purpose electrical system, and there was a definite limit on the total funds available.

Following an eight-month survey of public-assembly buildings in several large American cities, city and consulting engineers—later aided by the electrical contractor in working out practical details—have produced an unusually-adaptable municipal structure and electrical facility at a substantially reduced cost. The new Miami Beach Exhibition Hall is called the largest and most modern in the South.

Original engineering and imaginative use of orthodox materials in ingenious new ways helped cut the cost, and provided such a varied and comprehensive electrical service that trade observers believe it merits the close study of public building designers everywhere.

With a total of less than $4 million to spend for a conspicuously decorative building with 200,000 sq. ft. of total exhibit and meeting space—108,000 sq. ft. in one unobstructed chunk of assembly room with no supporting columns—the city thriftily acted as their own general contractor chiefly in the person of City Manager and Engineer Morris Lipp and his staff. This "saving" was considered justified on a community project, especially since all sub-contracts were let to local firms.

Consulting Engineer Henry J. Nelson made the electrical design, which was efficiently and cooperatively installed by Whitmore Electric Co., of Miami.

Careful planning

In the beginning, every time any plan was proposed for either building or wiring the engineers literally "took it apart" to see how the same or equivalent facilities could be secured for less money without sacrificing efficiency. The local engineers found, in their national survey, that on the whole many public buildings are extravagantly conceived and lack complete flexibility for varied and economical long-term use. Often political factors influence both costs and efficiency.

On the Miami Beach contract, the planners believe that they sweated out 30 to 50 per cent of the normal cost of a "wide-open" deluxe public building job partly by insisting that most areas of space and units of the electrical installation had to serve multiple purposes before they were even seriously considered. Some of the lighting and all of the power circuits can be used in two or more ways to meet large or small current needs in any location.

Outstanding electrical features include:

(1) Substantial and completely flexible power sources of several phases and voltages quickly available at any point in the 108,000-sq. ft. hall by plugging portable panels of different capacities into one or more of the 170 special floor boxes fed from conduit set in the concrete slabs.

(2) Variable-intensity high-bay incandescent lighting (without dimmers) 35 ft. above the floor of the main hall, fed from high-level panels and magnetic contactors both located on cat walks up near the lights and remote-controlled by a simple set of push buttons in a central mezzanine booth overlooking the hall.

(3) All main-floor lights controlled by areas from an elevated booth on a color-keyed switchboard to give positive and direct visual control to the operator in using different lighting units and intensities for different types of events.

(4) All main-floor sound amplifiers controlled by areas by another color-keyed board in the same booth.

(5) All air conditioning—the degree of cooling in every room throughout the whole building—controlled by areas on a single switchboard in the air conditioning room.

Community income

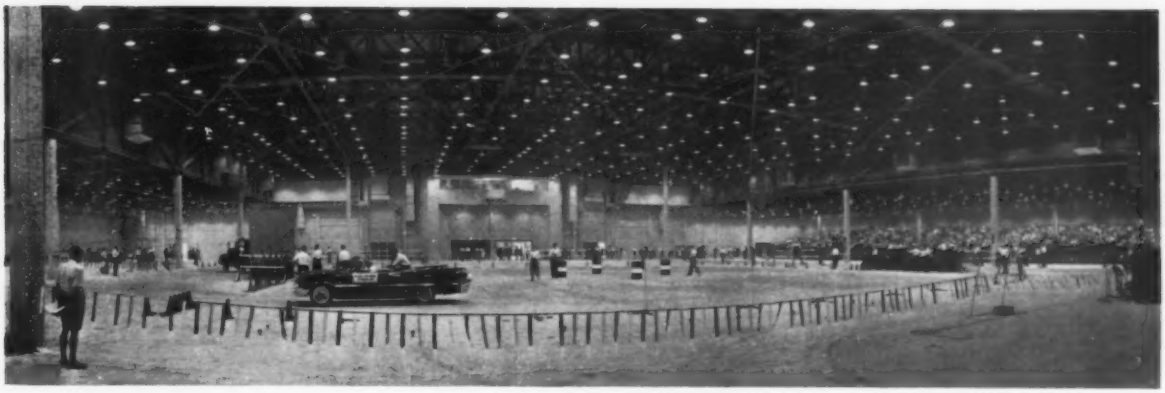
This whole 5-acre development, with adjacent parking facilities, is a crucial matter of "bread and butter" for the numerous beach hotels and the Miami resort area which largely lives from tourist business and conventions. The new facility is really a specialized, streamlined, adjustable "show case" for the area to sell conventions and commercial products to the nation through trade and merchandising meetings—also to sell many kinds of entertainment to tourists and home folks—all promoting local prosperity at the lowest possible cost. Holding fast to this central purpose helped to meet all difficulties of design and adapt them to economical methods and materials.

The 15,000-seat main hall is large enough to handle even the big national labor and political conventions as well as many other smaller gatherings. Already events worth $21 million in added community income have been definitely scheduled for the two peak spring months of the coming year, and the attendance of 110,000 additional convention visitors has been assured for just that short period.

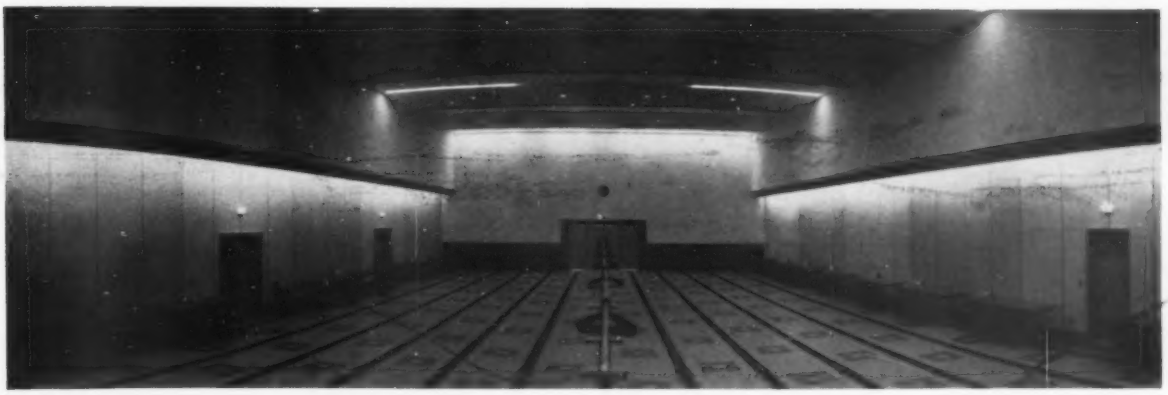
The main floor is more than twice as large as a football field; and with the two side wings, which can be curtained off to run three events at the same time, is large enough to stage a big circus, an

serves Miami exhibition building

Special cost-saving fluorescent fixtures light the lobby to the new, modern exhibition hall.

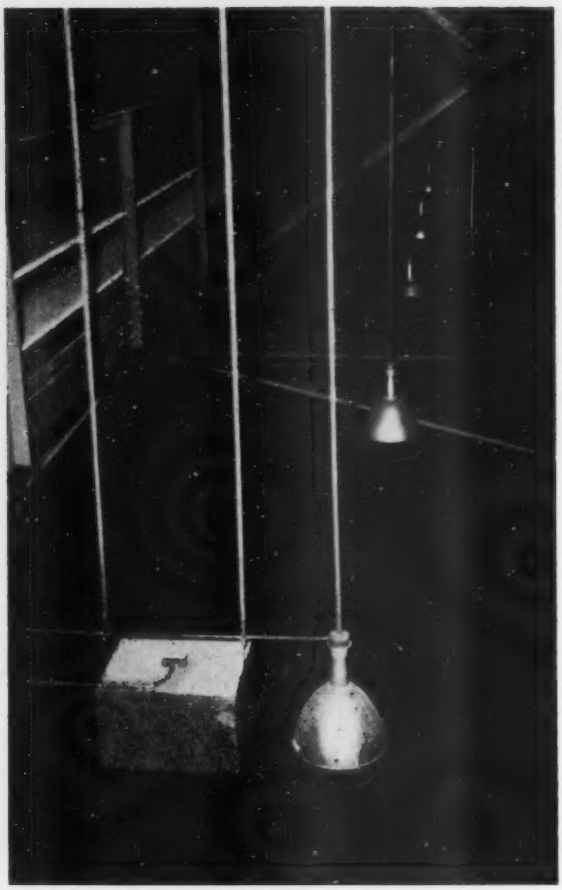


High-bay lighting is used in the main hall that accommodates everything from concerts to rodeos.



Indirect fluorescent lighting is used in this private meeting room set up for small conferences.

A single rolling scaffold is used for maintenance of the high bay lighting fixtures in the main hall. Two such scaffolds were used for the installation.



The all-incandescent high-intensity overhead lighting of the main hall is supplied by over eight hundred 500 to 1,500-watt units in Alzak reflectors.

ice-skating show, swimming meet, boxing match, basketball game, and concert all in rapid succession.

A dozen main-floor electrical-distribution centers provide coordinated control for special lighting for all these needs, and also switchboard service for the huge lobby, the 10 large private rooms, the catering, and other facilities. The total load is around 4,000 kw, with 1,500 kw of this going for air conditioning and the balance for light and power outlets. Over 1,500 fluorescent units were used with a comparable number of incandescents.

Cost cutting

Substantial and constructive cost cutting was begun in the high-ceilinged lobby. After getting prohibitive price estimates on decorative custom fixtures, the engineers designed a series of attractive and efficient low-cost ceiling units by fitting together four standard fluorescent fixtures in a rectangular metal frame. A large plastic sheet conceals the individual fixtures, and these assemblies are sufficiently "different" to give a custom and modern look from the floor 25 feet below, and all this was achieved at a fraction of the custom price.

Also, in the lobby ceiling a "cove" lighting pattern at the perimeter, supplemented by two large pear-shaped plastic designs and a large number of round recessed incandescent units for partial color correction, affords altogether 80-100 footcandles. There are 170 circuits for the lobby lighting, all numbered on the adjacent panel.

On the facade between the twin entrances is a 75- by 45-foot mural map of Florida made up of varicolored mosaic sections of tile and marble. The map is floodlighted from below by five 1,000-watt units hidden behind tile panels. To light the outside of the building and the grounds there are 20 available circuits for up to 200 par-type 150-watt lamps, self-contained units concealed behind the parapet walls. Under the canopy are 118 recessed incandescents.

Six lighted fountains with rotating color wheels spill into an oval pool on a half-moon shaped grassed terrace.

Decorative corridors with luminous ceilings lead to open-roofed patios on each side of the lobby with spot lights accenting fountains on one wall.

Main hall lighting

The all-incandescent high-intensity overhead lighting of the main hall is supplied by over eight hundred 500-to-1,500-watt units employing Alzak reflectors suspended by metal straps on 8 and 10-foot centers. This provides color correction for merchandise exhibits. These lights work off a "split" main panel, each half being supplied by a magnetic contactor in each area which is operated from

the control booth. The panels and contactors are on handy cat walks 45 feet above the mainfloor to limit the voltage drop at the fixtures.

The circuit distribution permits turning on either all or only part of the lights in each area by individual buttons. This supplies either 50 footcandles for exacting trade exhibits, or 25 footcandles or less for general meetings where less illumination is needed. In addition a separate circuit for emergency lighting furnishes 5 footcandles which is sufficient to clear the hall and furnish light enough for the cleaning staff.

In the course of a year this flexibility will save a lot on current consumption, and it also will avoid the necessity for any dimmer system which would be more complicated and expensive to maintain. Furthermore, the short runs from the cat walk panels to the high lights saved copper and permitted the exclusive use of 120-208-volt service. This eliminated higher-voltage circuits and the extra cost and maintenance of dry transformers. The main 1,000 kva oil-type units are the only transformers on the job. Only 208-volt motors were used throughout for the same reason.

On the main distribution panel, all emergency circuits are marked in red and segregated in one part of the panel. This makes it easy to hook in the emergency 150-kw generator in case of power failure.

The ten private meeting rooms, which individually accommodate 40 to 1,000 people, have recessed fluorescent lighting adapted to the contours of the ceiling and to the different color schemes of the rooms. The lighting is integrated in pattern with the zig-zag wall construction used to improve the acoustics.

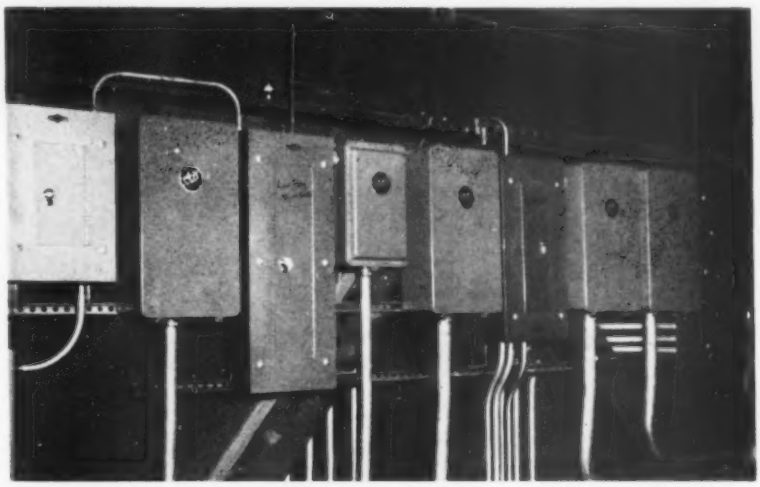
Flexible power sources

Probably the most original, useful, and long-range economy feature of the electrical design is the provision of substantial and fully-flexible power sources supplying varied types of on-the-spot service to all of the 834 trade exhibit booths, which can be quickly set up on the main floor. Conduit set in the concrete floor-slabs feeds 170 small floor-outlet boxes on 20 and 30 foot centers with 60-amp, 3-phase service. The capped boxes are flush-type, safe, and inconspicuous.

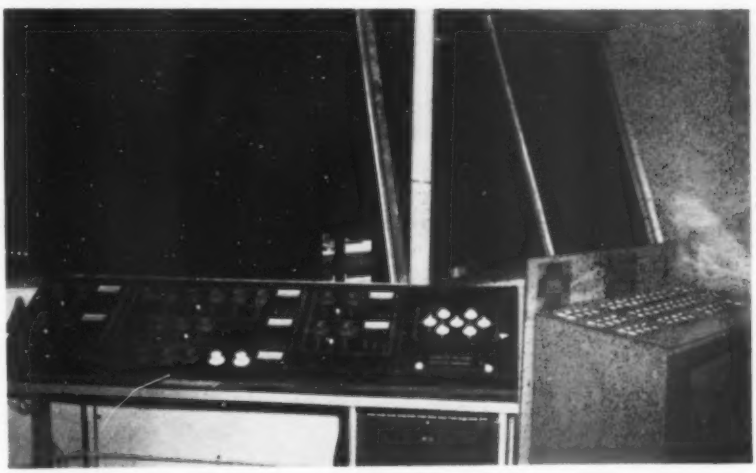
Small portable panels plug into

(Continued on page 122)

Small portable panels that plug into flush-type floor outlets provide varied service for trade booths at any point in the main hall.



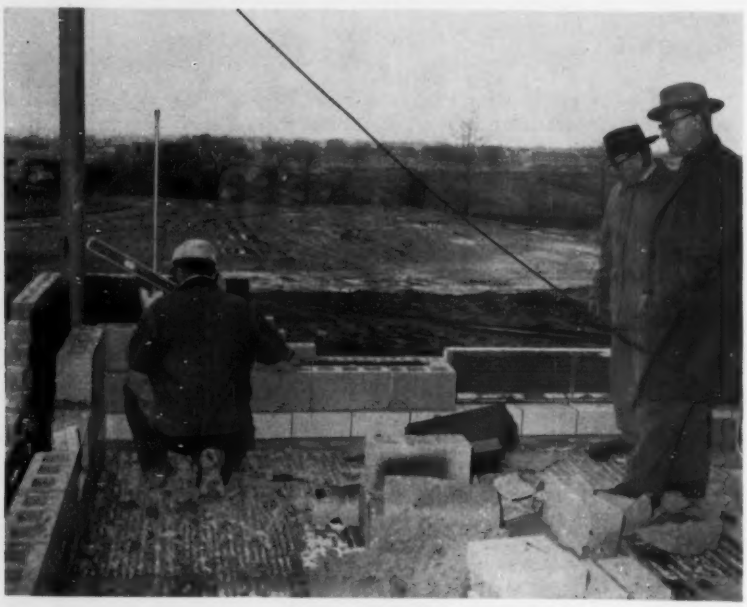
Cat-walk panels and magnetic contactors up near the high-bay lights provide remote control for all lighting fixtures in the main hall.



In the central elevated control booth, the light control board at the right controls the light in the main hall according to areas.

Exclusive use of electricity reduces

T. F. A. Unland, architect, discusses plans with job foreman from Paulus Construction Company and Gene Kelley of Union Electric Company for conduit being laid for the all-electric Bayless High School.



Mr. Unland watches workmen install 2-inch styrafoam insulation in the brick and concrete block walls of the first and second floors of the school to make sure the building is as air tight as possible.

By Carter Lewis

Commercial Sales Manager
Union Electric Company
St. Louis, Mo.

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers
- Consulting Engineers ✓

◆ AN EXAMPLE of how electric heating can be adapted for use in a large metropolitan school building is to be found in the recently completed Bayless High School in St. Louis, Mo.

Built at a cost of $531,559, the three story building has a total of 45,222 square feet, and includes 415 kilowatts of electrical heating. The average class room is 29 feet x 32 feet. Walls of the first and second floors consist of four-inch brick and six-inch block cavity wall with two inches of styrafoam insulation in the cavity. Ground floor is 12 inches poured concrete. The glass blocks used in some locations are eight inches square.

The electrical contract, awarded to Benson Electric Co., St. Louis, amounted to $92,009. This included $52,479 for electrical heating equipment and $39,530 for other electric work. Electric heat, therefore cost on $1.17 per square foot, and other electric work cost $.87 per square foot. The exclusive use of electricity in the building indicates the possibility of future additions to the school's electrical facilities. The wiring therefore, has been designed so as to be adequate for future air conditioning units if desired.

Winter design temperatures are 0-70 degrees Fahrenheit. Calculations show that the total heat transmission load equals 532,560 Btu per hour. The total ventilation heat load is 585,750 Btu per hour, and the total infiltration heat load is 376,000 Btu per hour.

costs for St. Louis high school

Many factors entered into the decision to use electric heat. Savings in construction costs, through elimination of boiler room, smokestacks, and piping, were found to be large enough to equip home economics and industrial arts departments. The safety factor was also considered. The non-explosive and non-combustible qualities of electricity are in its favor, as are the absence of leaks, rust, and pipe coverings.

It was pointed out that with electric heating there are no costly shutdowns because replacement of elements is relatively simple. There is also the factor of quick control of temperature in a classroom with electric heat. Once switched off, there is no heat shut-off lag as in other systems. The planners of the school looked, too, at the stability of electric cost. While the trend in other fuel costs appear to be upward, it is thought electric costs will remain constant or go down.

In the Bayless High School, the Minneapolis - Honeywell heating control system is designed to maintain lower night temperatures and restore the temperature to normal comfort level the next morning. The time clocks are staggered so that there is no instantaneous high demand in the morning. Room thermostats can modulate the steps in which the resistance heaters are energized. These units are brought into action in from one to seven steps, depending on weather conditions. In mild weather, full outside air can be admitted for cooling of classrooms.

All regular classrooms are equipped with unit ventilators of Herman Nelson design with either 10.7 kw or 13.3 kw, connected load, depending on exposure to outside weather conditions. Other rooms, such as those for biology, physics, shop, music, and library, have installed kw amounts varying from 8 kw to 26.6 kw, depending on size and exposure. The total heating kilowatts in unit ventilator is 357.8.

There are a number of other areas, such as rest rooms, corridors, storage areas, and the principal's

(Continued on page 124)

Bayless High School—This front view shows the architectural lines of the building. Small louvers under the windows are for unit ventilator air intake. The large glass areas in the front are offices.

This typical classroom lighted by nine 500-watt, silvered bowl, concentric ring, indirect type units averaging over 50 footcandles has a white acoustic ceiling and colored walls and chalk boards.

Foremen held responsible for tools

By John A. Crook
President
Crook-Dunn Electric Co.
Birmingham, Ala.

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

John A. Crook, president of Crook-Dunn Electric Company, looks over a board of small tools in his shop. The board has a place for everything and everything is in its place when not being used on a job.

This view of the Crook - Dunn shop shows how the conduit is stacked according to size. Good housekeeping is important in any shop, and Crook - Dunn keeps an accurate record of all material and tools at all times.

M. R. Reeve, superintendent for the company, takes a power tool from a metal box in which tools are stored on the job and locked after hours. Large items such as ladders are chained to posts when left over night.

◆ At Crook-Dunn Electric Co., Birmingham, Ala., the responsibility of keeping the right tools on the job is placed upon the job foreman, with the cooperation, of course, of the shop and management.

A simple memeographed form is used to keep a record of the placement of the tools, as they are ordered and as they are sent back into the shop. When they are returned to the shop, they are examined for repairs, cleaned, and placed back into tool stock after being checked back in from the job.

This record is solely for the purpose of keeping up with the tools. We make no effort to assess the cost of the tools used on any particular job. We compute this cost as our over-all expense of doing business.

A record is kept of the tool repairs which are customarily done outside our shop. We do not encourage our electricians to make the repairs because we estimate that if a man spends any time on such work, the electrical work does not stay on schedule.

It is necessary to have a tool when it is needed, therefore, on a large job, we try to keep two or more of a kind for the crew to use.

While the tools are on the job, it is the responsibility of the foreman to keep up with them. We provide tool boxes with locks for the smaller tools. We have found that it is a good idea to chain such

(Continued on page 126)

A warehouse enables the contractor to buy in quantity at considerable savings. These savings more than make up for high warehouse rent.

Careful buying of materials adds to contractor's profits

By J. D. Steele

President
Steele Bros., Inc.
Wheaton, Md.

This article should be especially helpful to the following readers:

Electrical Contractors ✔
Electric Utilities
Electrical Wholesalers ✔
Electrical Inspectors
Industrial Engineers
Consulting Engineers

◆ TOO MANY CONTRACTORS look at their 10 per cent markup as the only gain to be realized from a job. They overlook many factors that can add measurably to their profit. Looking ahead on each job, we try to figure out how we can do a better job at lower costs, keeping in mind what our employees can and will do under specific circumstances. We are in no doubt as to our objective and make this plain to our mechanics: we get jobs to make money.

Let me trace our system of handling a job from the time we estimate, through various practices, right up to completion.

Chart of material costs

We have worked out a chart that gives us an accurate cost of materials. Our system of estimating includes the cost of conduit, different sizes of wire, and all fittings applicable to that job. For example, a 100-foot run of 1¼-inch conduit with four #4 RH would cost a set amount, including all couplings, etc.

Other contractors may be guided by an estimating book, but we have worked out our own labor costs on the basis of surveys of what our men are able to perform within a given time on a job. These labor cost surveys also have a cost breakdown of a job by the week, and in weekly meetings of key personnel, we discuss and analyze our progress with a view to profitable accomplishment.

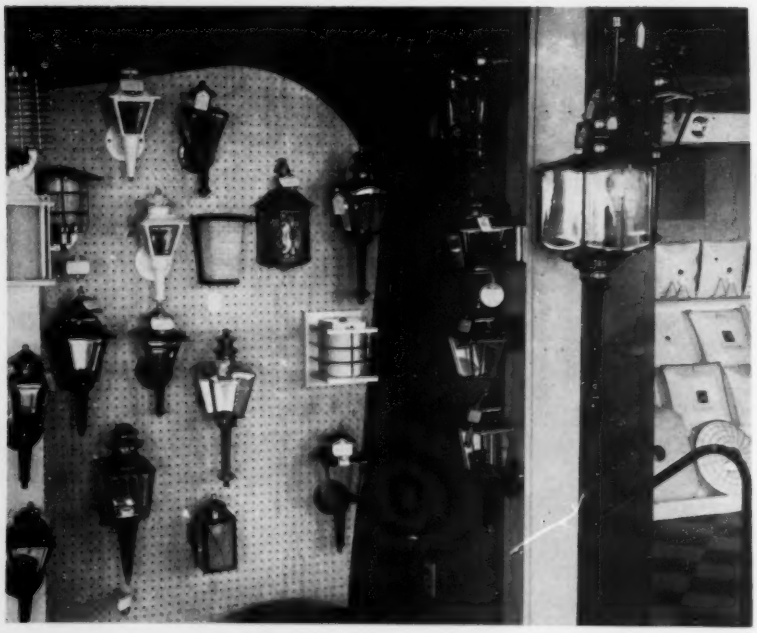
As president of the company, I initiate jobs and go over bids, checking them with the estimator. Obtaining plans, we determine which jobs to bid on, on the basis of equipment and men we have. Mindful of giving the customer value, we advise for example, re-

(Continued on page 125)

On this job redesigned by Steele Bros., Wheaton, Md., a free standing cubicle with switchboard avoided a mass of conduit on the walls.

Company's fixture business combined

Contractor Grady W. Cantrell at shop-built control board that lights and dims 69 displayed fixtures, 23 to each of three drum switches. Dimmer control is located on the wall at Cantrell's right.



The only way to do a good job for customers in Cantrell's area is to have a good stock of residential fixtures including outdoor fixtures.

By Baron Creager

This article should be especially helpful to the following readers:

Electrical Contractors ✓
Electric Utilities ✓
Electrical Wholesalers ✓
Electrical Inspectors
Industrial Engineers
Consulting Engineers

◆ In Wichita Falls, Texas, People's Electric Co. is owned and operated by Grady W. Cantrell, one of few bona fide electrical contractors who also deals in lighting fixtures.

Cantrell would much rather devote his energies exclusively to contracting and did so for 11 years —from the time he entered business in Wichita Falls in 1933 until 1954. Then he found himself forced to become a fixture dealer, too.

As a result he has the biggest and most outstanding stock of lighting fixtures in a vast area of West Texas. Nearest comparable stocks are in Dallas, 140 miles, and Fort Worth, 120 miles, east and south; Lubbock, 220 miles and Amarillo, 200 miles, west and south; and Oklahoma City, 150 miles north and a little east.

Large inventory

Under those geographical circumstances, it is relatively easy to understand why People's Electric has a normal inventory of about $17,000 in lighting fixtures and does an annual sales volume of more than $100,000. And it is easy to understand Cantrell's explanation of why he found it necessary to get into the fixture business.

"The only way to do a good job for customers, located as I am, is to have a good stock of residential fixtures," said Cantrell. "You have to have the fixtures on hand for customers will not buy from a catalog. They want to see the fixtures, and want to feel them.

"Of course, we do commercial lighting, but residential fixtures are our specialty. We stock both contemporary and traditional and

with contracting proves profitable

have some early American and some French Provincial.

"Recently, I attended the first National Home Lighting Exposition, and I expect to attend every such exposition that is held. Recently I attended the opening of a new fixture center in Dallas. As a contractor in Wichita Falls, I have to make these trips to do my buying.

Careful buying

"In my buying, I must be very careful. It is so easy to get some 'dogs' in the stock, and when one type of fixture stops selling, at least in this area, it has really stopped. When that happens there is no use putting on a fixture sale, for a 'dog' will hardly sell at any price.

"Oh, it may be that occasionally I can move a few outmoded fixtures to a certain type of builder, at below cost, mind you. But I am carrying around in the trunk of my car, one $40 fixture, still in the carton, that is a problem. I don't know what to do with the fixture except junk it. I have junked a lot of fixtures, but as I got deeper and deeper into the business, I learned some valuable lessons. My junking is not so heavy as it was at first."

Because of the permanency of obsolescence when it envelopes a certain type of fixture, Cantrell has learned not to stock too deep in numbers.

"However," he emphasized, 'it is essential to have a good selection, even though the cost is more. The better builders will buy the fine fixtures, but not the same numbers. In my position, I must constantly be on the lookout for new numbers that will move. It is also true that I must have in stock a lot of fixtures that people don't want, in order to sell one they do want."

Cantrell says the fixture business is a good business for a contractor if he is in position to stock good fixtures in keeping with the type of work currently being done. The margin is fair. It is obvious that Cantrell is proud of the merchandise on display, that he has a keenly-developed selective sense.

(Continued on page 121)

Cantrell feels that to make the display space pay, fixtures must be crowded. He has a normal inventory of about $17,000 in fixtures, and he does an annual sales volume of more than $100,000.

Because of the permanency of obsolescence when it overtakes a fixture, Cantrell has learned not to stock too deep in numbers.

Contractors tell how

Incentive awards profitable and good for company morale

By M. William Russell
East Coast Electric Co.
Hyattsville, Md.

◆ THE FIRST WEEK of December of every year, we make two awards to the two top mechanics whose trucks operated throughout the year at lowest costs. There is a first prize of $200 and a second prize of $100; if two mechanics come within a few dollars of each other, both get top awards.

We have found the awards an incentive to careful handling of equipment, pride in their records of increasing longevity to truck life, reduction of maintenance costs, and better trade-in values. With each man assigned a truck that only he handles, an accurate record is kept of each truck and its maintenance costs. We allow over a year's period the necessary gasoline, washing, greasing, periodic oil changes, and one tire.

On any Monday morning our nine mechanics can be found checking batteries, oil, gasoline, air pressure in tires, and giving their trucks a general inspection. Trucks carry insurance, but if a man was negligent or inattentive in driving and caused an accident, his record is charged with the damage under $50. Any repairs needed on a truck are recorded with date, kind of repair, cost in labor, and parts.

We have one '58 truck that has had only one repair, a brake job, throughout the entire year. Careful driving has kept that truck in excellent condition. We have a '55 truck that cost us new $2400. Good handling recently resulted in an $1800 offer on a '59 trade.

Thus, our $300 yearly award has proved effective in helping us derive maximum value from our $25,000 investment in our nine trucks.

We were faced with the problem of time-consuming coffee breaks that the men enjoy, and that we want them to have, though they are costly in time loss. Two men on a truck stopping for half an hour's refreshment before going on to the next job costs the company an hour. Nine mechanics having coffee breaks several times daily boosts the loss to about six hours.

At one of our weekly meetings we talked the matter out, and decided we could save time and money by having our own coffee

Monday morning finds mechanics checking air pressure in their tires to keep truck maintenance costs low. A big bonus awaits the mechanic who holds costs down at East Coast Electric Company.

Coffee on tap for the mechanics saves six hours of company time otherwise taken for coffee breaks on the road. James M. Lewis, job foreman, helps himself to morning coffee before leaving on a job.

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Always order your tools – hand tools as well as the power driven muscle savers – from Graybar. Because Graybar Suppliers are the outstanding manufacturers in this country, Graybar is the most authentic – and the most convenient – source of everything electrical. Whether your current problems take in large industrial projects, groups of modern homes, stores or individual house wiring, it will pay you to put the nearest Graybar Specialist on your team. Call Graybar today – for anything from a pair of eight inch side cutting pliers to a hydraulic pipe bender.

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urn here in the office, with sugar and cream for those wanting it. The company furnished a $14 percolator and one pound of coffee weekly, a second pound is furnished weekly by the employee whose turn it is to do so in accordance with a set rotation. We are saving six hours a day, with the men serving themselves before they go out, or whenever they drop in.

As a company formed only six years ago, we have retained the men who started out with us, and apprentices added under the Department of Labor's program, who are now journeymen, comprise our staff of nine. All have been with us from four to six years. We believe that confidence and trust must be implicit in employer-employee relations. Social benefits in keeping with the progress of the times are an important part of the program. Our men enjoy paid vacations, paid holidays, and are compensated in accordance with the Department of Labor's wage scale. Uniforms are furnished them. Working closely together, we keep morale high.

Fixture for outlet boxes proves a great timesaver

By J. V. Hayes
Power Electric Company
Port Lavaca, Texas

◆ STORAGE of outlet boxes, switch gear, and panels was a problem for us for several years until we hit upon the idea of building a special combination display-storage fixture exclusively for these items.

When we stored the units in the regular warehouse, invariably when the warehouse man lifted a switch gear from the shelf, several others fell down, too. He also had difficulty finding the right size outlet box and getting it down from the shelf without dropping others. When a warehouse man is in a hurry and an item falls from its allotted shelf, he is not as careful as he should be when he replaces it. As a result, we had sizes mixed, causing further delay in filling a requisition.

Now we carry all outlet boxes atop a special fixture we built for this specific purpose, the fixture is located on the floor in our small combination office and customer room.

It is 12 feet long, four feet wide, and four feet high at the highest point. The highest point is in the middle, with the framework sloping downward six inches each way to the top of the outside framework.

The open top is divided into 16 compartments, each two feet wide and one and one-half feet long. A different size outlet box goes into each compartment.

Now, when it is necessary to get one or several boxes in a hurry, they are separated according to size, and it is simply a matter of picking out the boxes needed.

Also, we have found a special bonus provided by the new system is that it has slightly increased the sale of boxes to small contractors who come to us for supplies. They have learned to go to the display boxes and wait on themselves. Thus we can serve them much faster.

The space between the bottom of the compartments and the base of the fixture is divided into larger sections. Here we stock switch gears and panels. What the fixture has done for handling outlet boxes it has also done for handling these items.

The open top of the fixture is divided into 16 compartments.

To stay big set your sights on big work

By L. E. Dyal, Jr.
L. E. Dyal Electric Co., Inc.
Tampa, Fla.

◆ IT'S NO TRICK to land a big job; the trick is to make money after you have it. The contractor who goes after big work should be his own estimator and buyer, because he has to make money on his purchases. Lacking the desire or ability to be his own estimator, he must then secure for this vital post a capable person of unquestioned ability and loyalty, willing to work the clock around and willing to bid every job that comes along. "If you bid them, you'll get some of them. If you don't bid them, your name will be forgotten, and you'll be counted out of the running."

Everything else in the wiring business in secondary in importance to estimating. It is silly to retreat from bidding a job just because some cut-pricer is bidding it.

In our case we keep our overhead low by not soliciting small work, because unless it is in town, it is bound to boost overhead. As it is now, our small in-town work pays our overhead, which is kept low by not trying to compete with a man who works out of his truck. If you intend to stay big, you must set your sights on big work, so you can buy right.

We need only two rooms for our business, an estimating and a bookkeeping office, along with a small shop. It is a waste of room, time, and capital to have a shop load of stock you can have delivered at the job site for a phone call to your supplier. When we finish a job, our best bet is to junk leftover bits of material. If you bring leftovers back to the shop, you may have the best intentions to utilize it on another job, but you seldom do, and all it does is accumulate. If you have bought right for the job, all you bring back is a little cardboard box full of material. Of course, we do return conduit and wire to our little shop and transfer it to other work through a purchase order as on a new job.

I do the estimating, make the contacts with architects, engineers, and contractors. My father keeps

• Southwire Galvanized Steel Strand

STRAND SIZE	5/8"	1/2"	7/16"	3/8"	5/16"	9/32"	1/4"	3/16"
WEIGHT PER 1000'	813 lb.	517 lb.	399 lb.	273 lb.	205 lb.	164 lb.	121 lb.	72.9 lb.
MINIMUM BREAKING STRENGTH IN POUNDS								
ASTM A-122-54T								
Galvanized (Single Galv.) Common	11600	7400	5700	4250	3200		1900	1150
Class A (Double Galv.) Common	11600	7400	5700	4250	3200		1900	1150
Class A (Double Galv.) Siemens-Martin	19100	12100	9350	6950	5350	4250	3150	1900
Class A (Double Galv.) High Strength	29600	18800	14500	10800	8000	6400	4750	2850
Class A (Double Galv.) Extra High-Strength		26900	20800	15400	11200	8950	6650	3990
Class A Utilities Grade, A.T.&T. and Western Union Spec.—7-wires		25000	18000	11500	6000*	4600		2400**
ASTM A-363-55T (No welds)								
Weldless High-Strength		18800	14500	10800	8000			
Weldless Extra High Strength		26900	20800	15400	11200			

*weight per 1000'—225 lbs. **weight per 1000'—80.3 lbs.

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Southwire Galvanized Steel Strand is manufactured to meet or exceed applicable ASTM specifications . . . and preformed to eliminate flared ends when sheared. Quality is our first concern, including premium-quality non-returnable reels on all reel shipments. Available in 250', *500' and 1,000' coils, 2,500', *5,000', 5,280' reels. Feel free to inquire about special packaging to suit your particular requirements.

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*Stock items

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- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene, Polyethylene, and VWP (Vinyl) Weatherproof Copper, Aluminum and Triplex
- U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Galvanized Steel Guy Strand and Static Wire
- Aluminized Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories
- NM Sheathed Cable

• ALSO FABRICATORS OF COPPER AND ALUMINUM FOR WIRE AND CABLE MANUFACTURERS

close contact with work progress. We avoid bird-dogging our foremen because that way you betray their trust. Nevertheless, we maintain very close and detailed tabs on all work.

The man who estimates the job should do the buying too, because if buying is relegated to another, the buyer must retrace the estimator's footsteps in order to acquire a familiarity with the job's needs. This may cause errors to creep in, and does cause wheel slippage through duplication of effort.

We do no further business with someone with whom we have had difficulty getting our money. Why boast about a $100,000 job you took for its 'prestige' and for which you did not get paid? We would rather do a hundred-dollar job for which payment was prompt and free from argument. That is the reason we have not lost more than $300 in bad debts, on a million-dollar-a-year volume.

If we do not get our draw, we call a halt to the job at once by withdrawing our men. We are not afraid to antagonize a bad-pay customer, and we do not believe in being too lax in our collection efforts.

"You don't need the customer who'll hurt you!"

We keep a very watchful eye out on the general contractors who are working on the sub contractors' money, because they are holding ours, too. We will not take a job unless its bonded. Even if you know the contractor's bonding is okay, bonding keeps you from getting too big too quick. The bonders check your background; they know your business capabilities as well as you do. We consider the bonders our first line of defense against financial set-backs.

Every job must stand on its own financial legs. We make our draw according to what we have on the job, and we pay our bills, thus avoiding the dangerous policy of taking the money from one job to another. We shun this "Rob Peter to pay Paul" thinking.

With a collect-as-we-go, and pay-as-we-go operation, we reduce bookkeeping on each job to a simplicity that enables us constantly, throughout every job, to head off the financial morass which has the traitorous semblance of prosperity because big money is being turned over.

Trailers transport and store equipment at job site

By W. A. Iverson
Iverson Electric Co.
Greenville, S. C.

◆ A FEW YEARS AGO, we saw the need for a convenient way of transporting tools and for a proper place to store them at the job site. Our solution was a small utility trailer, which has an angle iron frame covered with sheet metal. After we added a pitched roof, the trailer was found to serve our purposes more than adequately, and we now have a half dozen in constant use.

A surprisingly large number of tools are carried and stored in the trailers: hydraulic bending equipment, band saw, rigid oil buckets, ditching machines, cutters, covering for machines, gasoline, greasing equipment, chain vise, power machine, hydraulically operated knock-out. Time and work is saved at the office, because there is no loading or unloading of all this equipment except at the job site.

No one is allowed to take just part of the equipment on a trailer. If that were done, tools would be scattered and impossible to check in and out accurately. Also, this policy enables us to be sure that a trailer is completely equipped and ready for any job.

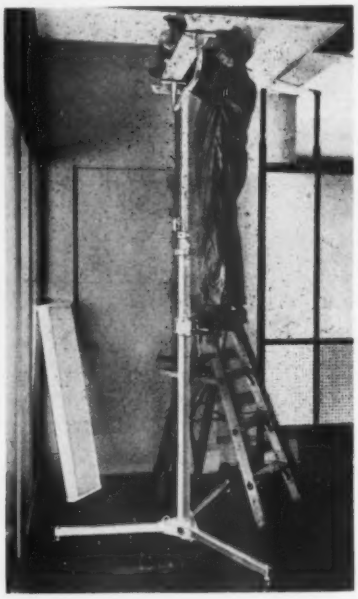
The trailers are locked with combination locks. This has several advantages. There are no lost keys and therefore no ruined locks or lost time. Also, if conditions warrant, the combinations can be changed at any time.

Our wire pulling equipment is carried on a separate trailer. With the cable puller is a hand operated winch, a wire reel for storing steel cable, and wire lubricant. This trailer is not covered, but it could be easily enough.

Improved hoist lets one man install fixtures

◆ A NEW, IMPROVED fixture hoist is now available to electrical contractors to lift and hold fluorescent lighting fixtures in place so that one man can make the installation. By eliminating the extra man who would ordinarily have to hold the fixture, the electrical contractor saves man-hours and money. He is able to bid lower, get more jobs, and make more profit. Contractors report that the hoist pays for itself in 2 weeks in labor savings alone.

The new universal cradle has 3 sets of adapters which are easily and quickly inserted. One set has a 6-inch spread, the second set has an 18-inch spread, and the third set is "V" shaped for holding pipe and other cylindrical objects. The 18" adapter is drilled so that a piece of plywood can be attached to form a platform. The cradle adapters are rubber-covered to protect the finish of the materials being lifted, as well as to give a better grip.

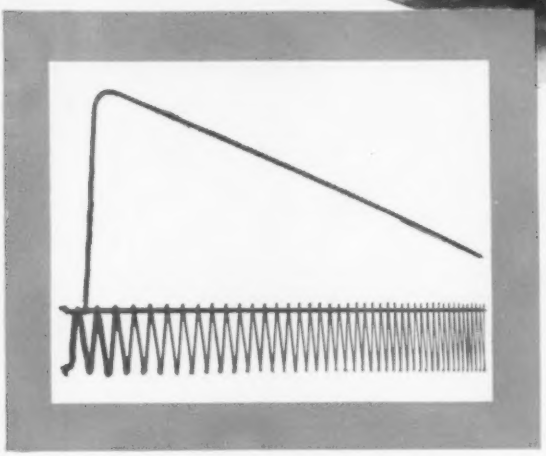


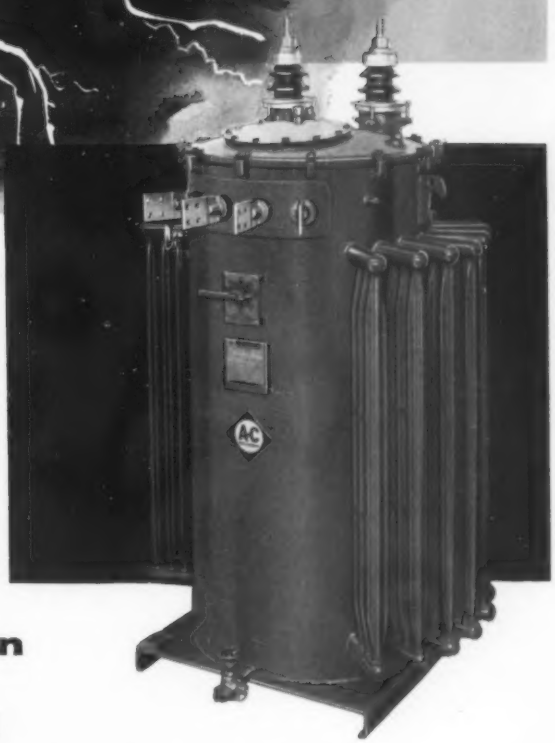
This fixture hoist enables one man to handle heavy lighting fixture installations without additional help.

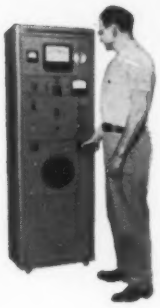
Manufactured by Lantz Manufacturing Co., of Valparaiso, Ind.,

(Continued on page 126)

ALLIS-CHALMERS modern line for '59







Insulation strength assured

Automatic fault detector oversees impulse tests of Allis-Chalmers distribution transformers

Even the smallest fault triggers a flashing red light and an alarm bell. Thus the new automatic fault detector eliminates human error in impulse testing. What better assurance that overall insulation strength meets all standards—that insulation will withstand severe lightning and surge conditions!

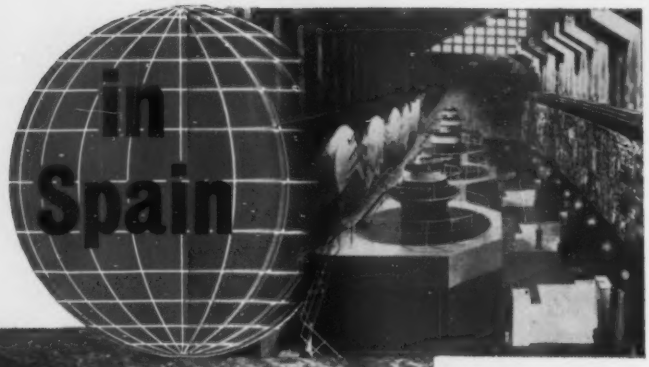
Every Allis-Chalmers distribution transformer, from 5 to 500 kva, is impulse tested on the production line. The record of operating reliability proves the wisdom of this policy. Call your A-C man for details, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Plan to stay ahead... MODERNIZE!

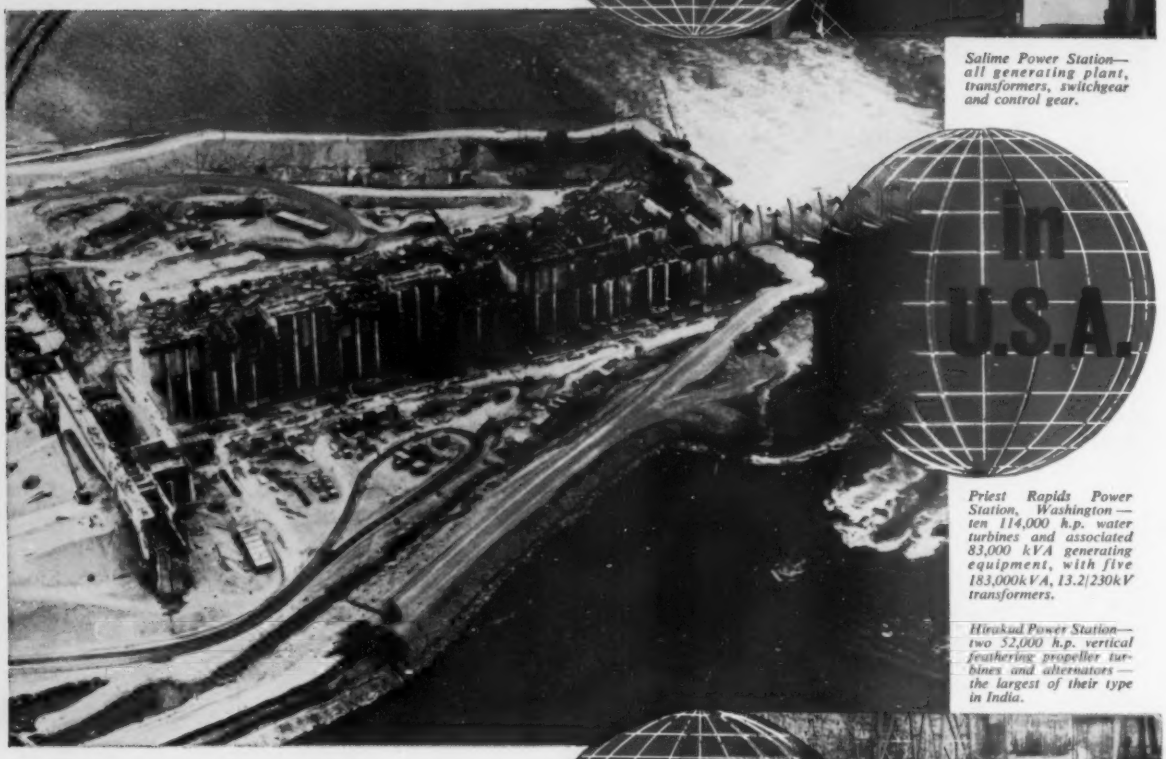
ALLIS-CHALMERS

A-5906

The world over...

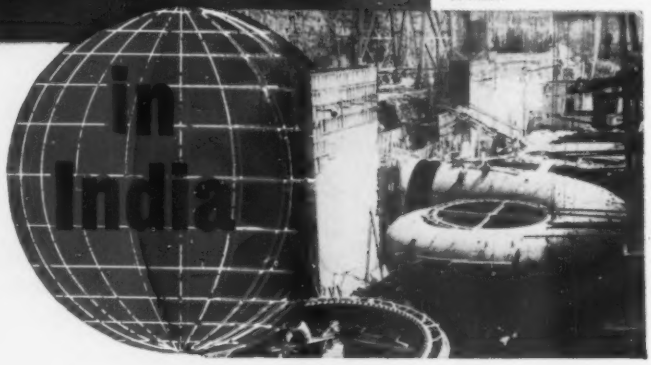


Salime Power Station—all generating plant, transformers, switchgear and control gear.



Priest Rapids Power Station, Washington—ten 114,000 h.p. water turbines and associated 83,000 kVA generating equipment, with five 183,000kVA, 13.2/230kV transformers.

Hirakud Power Station—two 52,000 h.p. vertical feathering propeller turbines and alternators—the largest of their type in India.



'ENGLISH ELECTRIC' water turbines and generators have been installed throughout the world. At three major schemes in the United States, 'ENGLISH ELECTRIC' hydro-electric equipment will be adding some 1,630,000 h.p. to America's power potential.

'ENGLISH ELECTRIC' products cover all aspects of the generation, transmission and utilization of electric power. Service facilities are available through three large Canadian plants. Contracts have been completed and are in course of manufacture for many other major American power projects.

'ENGLISH ELECTRIC'

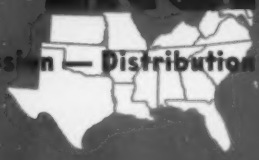
Agents for Washington, Oregon, Montana, Idaho, Wyoming, Nebraska, California, Arizona, Utah, Nevada and the Alaska territory: **James I. Metcalf & Co. Inc.**, 701 United Pacific Building, Seattle 4, Washington. Branch offices in San Francisco, Los Angeles, Portland, Phoenix. Agents for Georgia, Alabama, Tennessee, South Carolina, Florida and Kentucky: **Osgood & Associates, Inc.**, 988 Spring St., N.W., P.O. Box 7383, Station C, Atlanta 9, Ga. Agents for Louisiana and Mississippi: **Electron Equipment Co. Inc.**, 1050 Constance St., New Orleans, 13, La. Agents for Texas, Oklahoma, Arkansas and New Mexico: **Peabody Bros.**, 2903 St. Louis St. at Oakland, Dallas 26, Texas. Branch offices in Houston and Tulsa.

Enquiries for territories not covered by Agents should be directed to:

ENGLISH ELECTRIC EXPORT & TRADING CO. LTD., 750 THIRD AVENUE, NEW YORK 17, N.Y. Telephone: MURRAY HILL 7-0303

OC/US/2

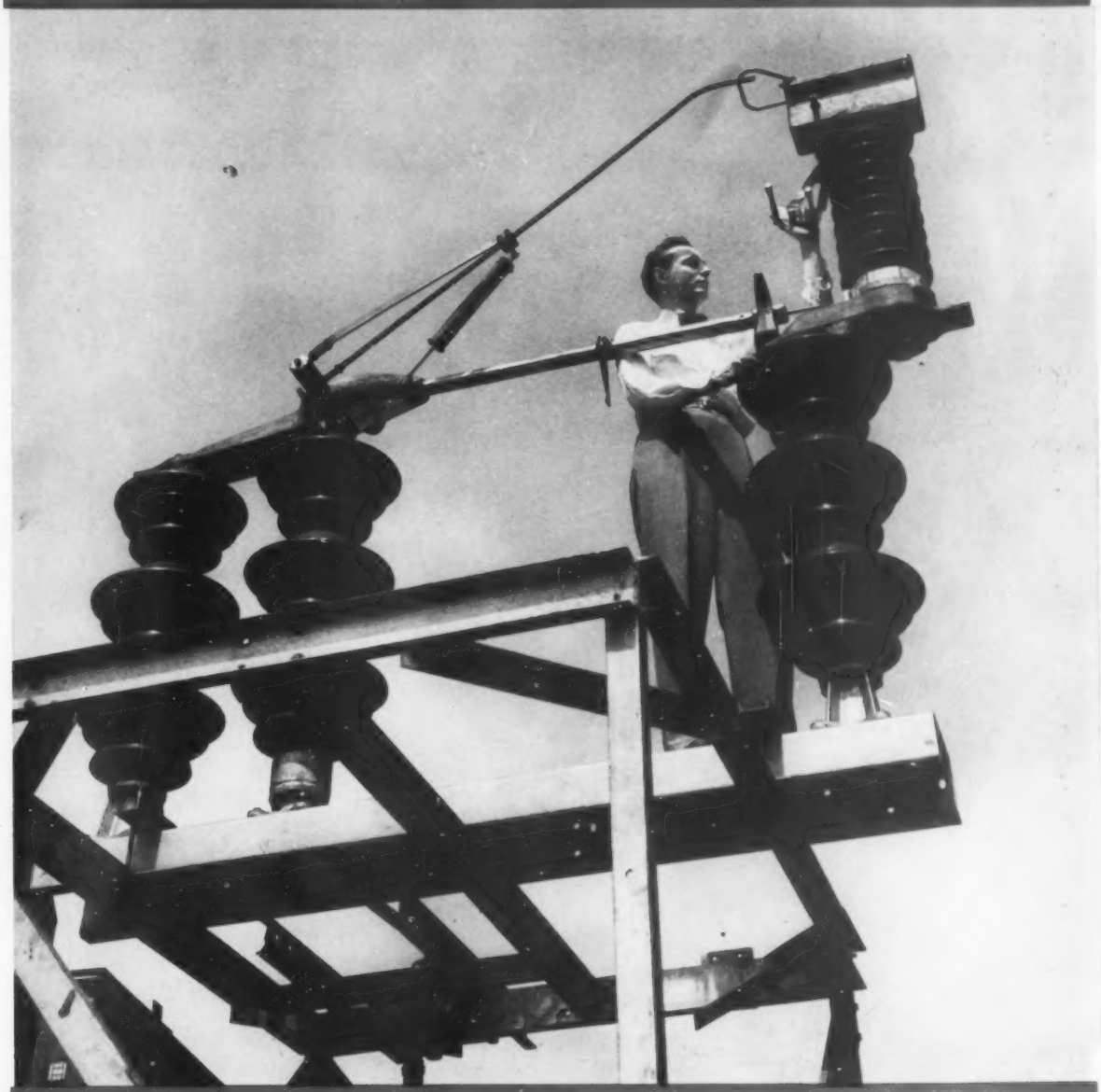
UTILITY ENGINEERING



Transmission — Distribution — Metering

Design
Installation

Testing
Maintenance



Sulfur hexafluoride as an arc interrupting medium—page 58
Simplified guide to regulator loading—page 62

Neoprene jacket on Anaconda cable takes impact of avalanche

This 5000-volt cable had already provided 5 years of service when a strip mine mishap buried it under tons of rock. The cable was supplying power to a giant ore stripping shovel when an overhanging section of a 90-foot cliff suddenly collapsed.

The rockslide stretched, gouged and pounded a 500-foot section of the neoprene-jacketed cable . . . but didn't knock it out. The buried cable continued to maintain service.

To protect the strong internal construction of their cable, Anaconda Wire and Cable Company use jackets of Du Pont neoprene. Installations like this prove that neoprene has the necessary resilience to prevent cutting, gouging and impact damage, and neoprene's excellent weatherability and resistance to chemicals, oil, heat, cold-weather stiffness provide *protection that lasts.*

You can be sure of long-lasting performance when you specify neoprene jacketing on wire and cable. For details, write to E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. ES-3, Wilmington 98, Delaware.

DU PONT
REG. U. S. PAT. OFF.

SYNTHETIC RUBBER

NEOPRENE
HYPALON®
VITON™
ADIPRENE®

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

DEVELOPED TO MEET YOUR NEEDS:

400/800 ampere *Dual Range* CURRENT TRANSFORMER

This new dual range transformer was developed to meet *your* needs. It combines greatly extended range with all these other features of BH-6 Transformers:

OVAL SHAPED WINDOW for greatest flexibility in application with the greatest usable opening of any 600 volt current transformer.

COMPACT DESIGN makes it easy to mount. It's the smallest, lightest transformer in its class.

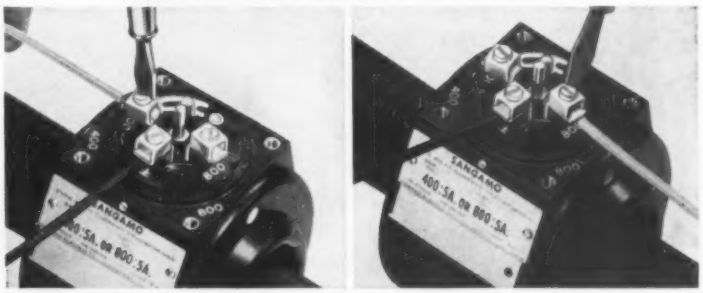
COLOR CODING . . . BH-6 Transformers are color coded in standard resistor colors for quick identification. (The new 400/800 rating is molded in black.)

CERTIFICATION OF ACCURACY. . . A certificate of accuracy test is supplied with all Sangamo current transformers. They arrive ready for you to put on the line.

you asked for it... a 400/800 ampere rating in a BH-6 Current Transformer that could provide extended capacity for future growth after initial installation on the 400 ampere range. By using one or more primary turns, this one transformer can be used on loads ranging from 40 to 1600 amperes.

Now, you can drastically lower your transformer stock levels, sharply reduce expensive changeouts, and get 0.3 accuracy class on all loads from 40 to 1600 amperes.

DUAL RANGE FEATURE:



Changing range is as simple as 1-2-3. First, close the short circuiting link. Second, transfer the secondary lead from the 400 to the 800 amp terminal. Third, open the short circuiting link.

SM59-2

SANGAMO *Electric Company*
SPRINGFIELD, ILLINOIS

Your Linemen will prefer

"PRESS-ON"

Faster, easier two-handed installation

1 SLIP INTO DIE with tap wire in "Press-On"
2 HOOK OVER THE RUN; no tab to bend
3 CRIMP with your present tools—Hand or Hydraulic
"PRESS-ON" CONNECTOR
Patent Pending

Complete Wrap-Around of each conductor in a solid metal wall—with a *lap joint* on the run—keeps out corrosion.

Built-in Solid Aluminum Separator prevents strand cutting; minimizes cold flow in aluminum to aluminum or corrosion in aluminum to copper.

and for your Engineers .....

Made of pure aluminum, factory treated and filled with "Cual-Aid" oxide inhibitor, and individually wrapped. 23 sizes from No. 6 sol. to 4/0 ACSR. **Crimped with your present tools,** using dies and grooves you now have, or Penn-Union dies.

Write for Samples—test this faster, safer, more dependable compression tap, "Press-On." PENN-UNION ELECTRIC CORP., Erie, Pa. *30th Year of Service to the Electrical Industry.*

There's a **NEW** and **BETTER** way at **PENN-UNION**

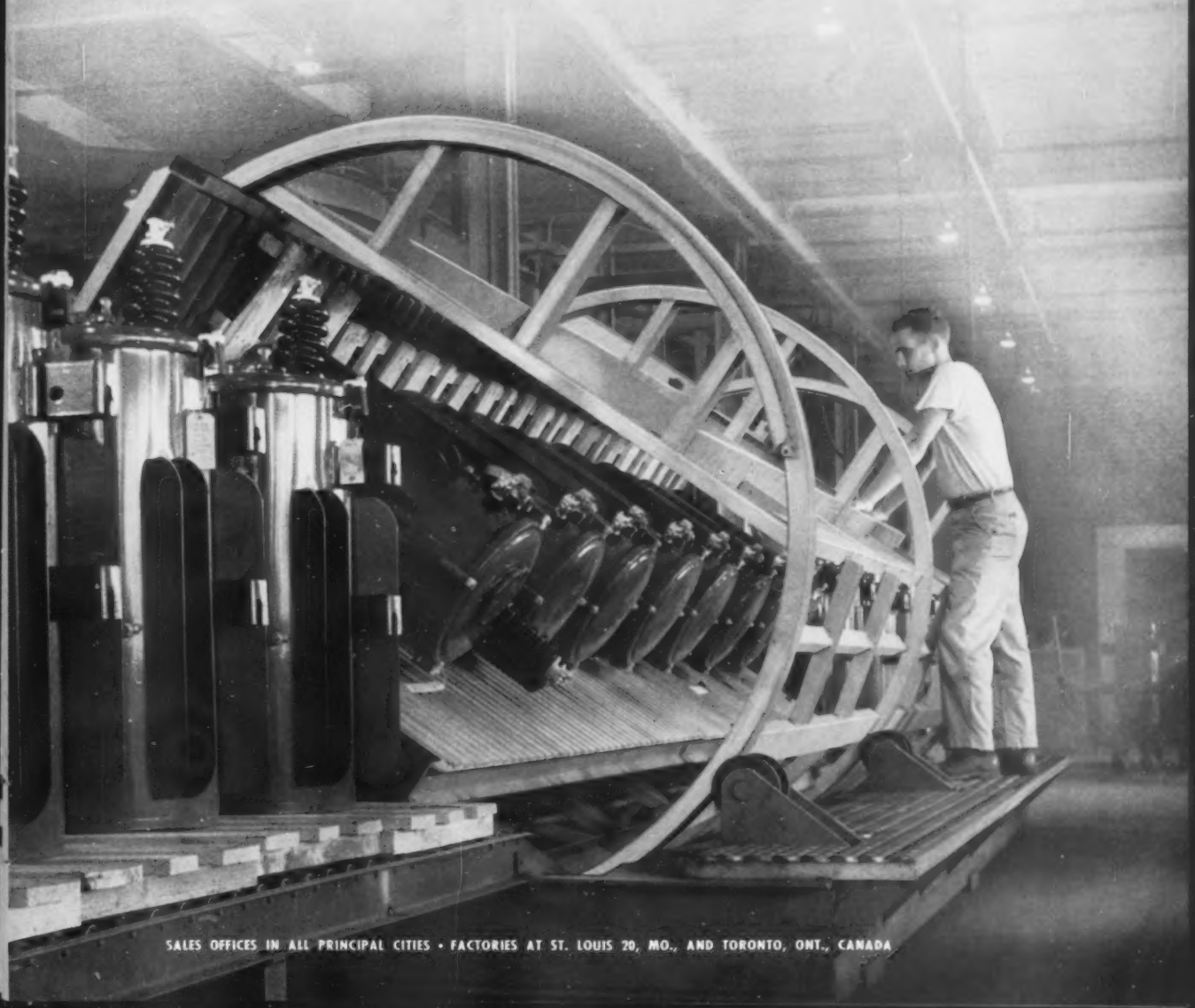
bottoms up for top performance

Moloney literally turns things upside down to assure long life and trouble-free performance of its distribution transformers. As a final check, following a rugged series of automatic electronic tests to determine the equipment's compliance with EEI-NEMA and Moloney standards, each transformer is inverted so that the oil presses against all sealing gaskets. Every point must be leak-proof, to keep oil in; moisture and other foreign matter out.

This is just another example of how Moloney Electric Company designs and builds transformers to stay in service longer. Take advantage of Moloney's more that sixty years of experience in the manufacture of only one product—transformers . . .
Make it Moloney All Along The Line.

MES8-30

MOLONEY ELECTRIC COMPANY



SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT., CANADA

INTERLOCKED ARMORED CABLE

For Power Distribution in New Plants or in Modernizing Old Plants For more current capacity than cable in conduit or other armored cable, *specify and buy Rockbestos A.V.C.* . . . for easy installation on racks or hangers beneath the ceiling or next to walls, *specify and buy Rockbestos A.V.C.* . . .

. . . To eliminate costly conduits and ducts . . . to save important dollars on materials and installation time, to permit quick, easy repairs, *specify and buy Rockbestos A.V.C.*

. . . All interlocked armored cables are not alike . . . and, for maximum dollar-savings and maximum performance be sure to *specify and buy Rockbestos A.V.C.* Interlocked Armored Cable — the superior AVA Cable.

Write now for the new Rockbestos manual which gives the application and design data to help you *specify and buy Rockbestos A.V.C.*

ROCKBESTOS PRODUCTS CORPORATION, NEW HAVEN 4, CONNECTICUT

NEW YORK • CLEVELAND • DETROIT • CHICAGO • PITTSBURGH • ST. LOUIS • ATLANTA • DALLAS
SEATTLE • LOS ANGELES • BURLINGAME, CALIFORNIA

ROCKBESTOS A.V.C.

THE SUPERIOR A.V.A. CABLE

FIT RIGHT! WORK RIGHT!

details make the difference

FARGO "5000" CONNECTORS

Every detail in every Fargo "5000" series connector is right . . . "V" grooves assure perfect conductor alignment . . . greater compressive force . . . conductors completely enclosed . . . high strength . . . vibration proof . . . well rounded corners . . . flat surfaces for back up wrench . . . reusable . . . AND "ONE-PIECE," always threaded, no loose parts.

Fargo's "vise-type" designed connectors are easy to install . . . assure trouble free, long lasting electrical and mechanical connections . . . have a high efficiency for converting a torsional force into a compressive one . . . make a low resistance connection . . . are available from 8 sol. to 1,000 CM . . . *ask your Line Material Engineer for complete details.*

Distributed by
LINE MATERIAL INDUSTRIES
McGraw-Edison Company
Milwaukee, Wisconsin
In Canada, CANADIAN LINE MATERIALS, LTD., Toronto, Canada

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York

FARGO

ELECTRICAL ENCLOSURES

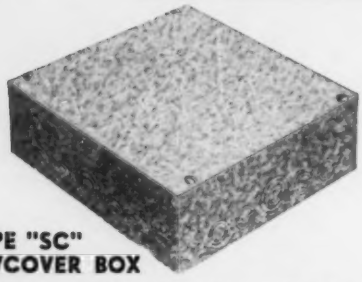
STEEL or ALUMINUM

Contractors, Industrials, Utilities, Municipalities, REA's

CABINETS AND BOXES

TYPE "PF" TELEPHONE CABINET

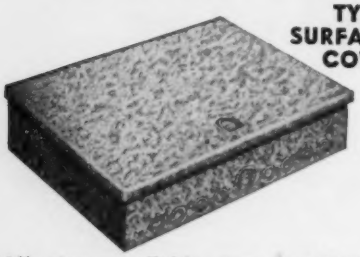
Surface or Flush Mountings in either galvanized or grey enamel finish. Constructed from the finest steels available, all in compliance with the Underwriters Laboratories specifications.



TYPE "SC" SCREWCOVER BOX

Durable Formed Construction, galvanized or grey enamel finish, with or without knockouts. Sizes to your specifications.

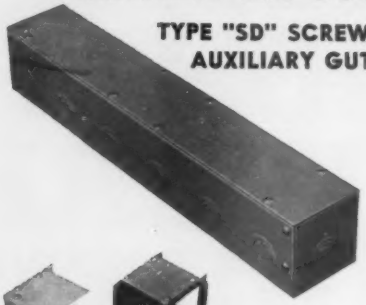
TYPE "A" SURFACE HINGE COVER BOX

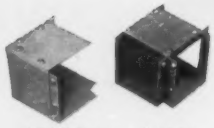


All sizes available for electrical cutouts, switches, relays, junction and pull box applications, galvanized or grey—with or without knockouts.

WIREWAYS and DUCT

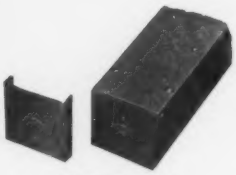
TYPE "SD" SCREW COVER AUXILIARY GUTTERS





ELBOW and TEE

"U" CONNECTOR

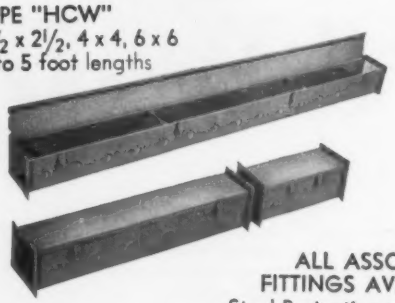


END CAPS

For Switches, Panel Boards or Straight Runs, you can't match the flexibility, greater capacity and easy installation of B&C wireways. Die formed construction of heavy gauge sheet steel, as specified by the Underwriters Laboratories and the National Electrical Code.

HINGED COVER WIREWAYS

TYPE "HCW"
$2\frac{1}{2} \times 2\frac{1}{2}$, 4 x 4, 6 x 6
1 to 5 foot lengths



ALL ASSOCIATED FITTINGS AVAILABLE
Steel Protection of Electric Conductors, plus Accessibility.

Economical to install and maintain — tapping, splicing, additions, inspections, may all be made within the limitations of the National Electrical Code.

Write for descriptive catalog containing installation data and current price list.

B and C

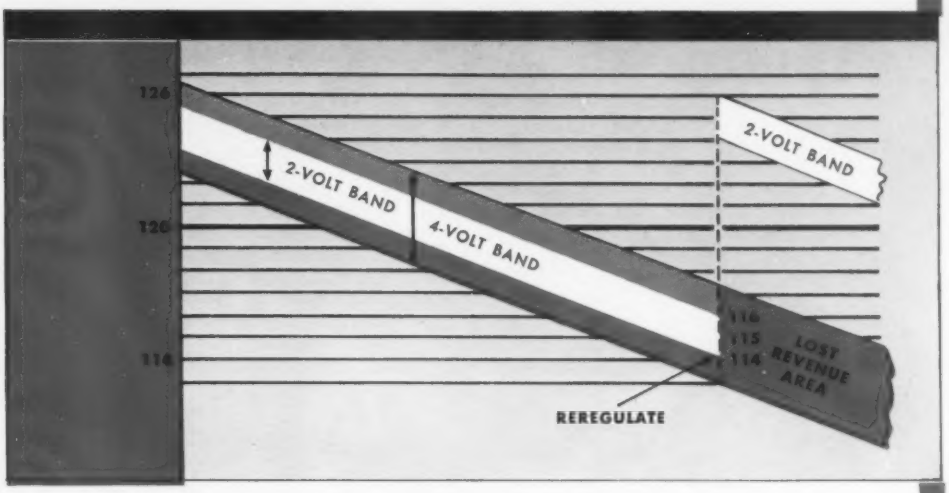
Your Seal of Dependability and Safety

METAL STAMPING COMPANY

590 MEANS ST., N. W. • ATLANTA, GEORGIA

ALLIS-CHALMERS — 25 years of 5/8% Regulator Leadership

Losing revenue?



Here are 4 steps to increased revenue!

"Engineered regulation" provides added revenue — improves service while cutting regulation cost as much as 50%. Each single volt increase in average voltage on a feeder (toward the optimum) means $1 per customer per year increased revenue. At the same time "engineered regulation" is lower cost regulation.

Four basic steps are:

1. **Cut band width to two volts.**
2. **Reregulate feeders.**
3. **Use low-cost 5/8% step regulators.**
4. **Engineer to *fully* utilize *Vari-Amp*.**

Allis-Chalmers leadership and engineering experience are ready to help you work out a four-step regulator program.

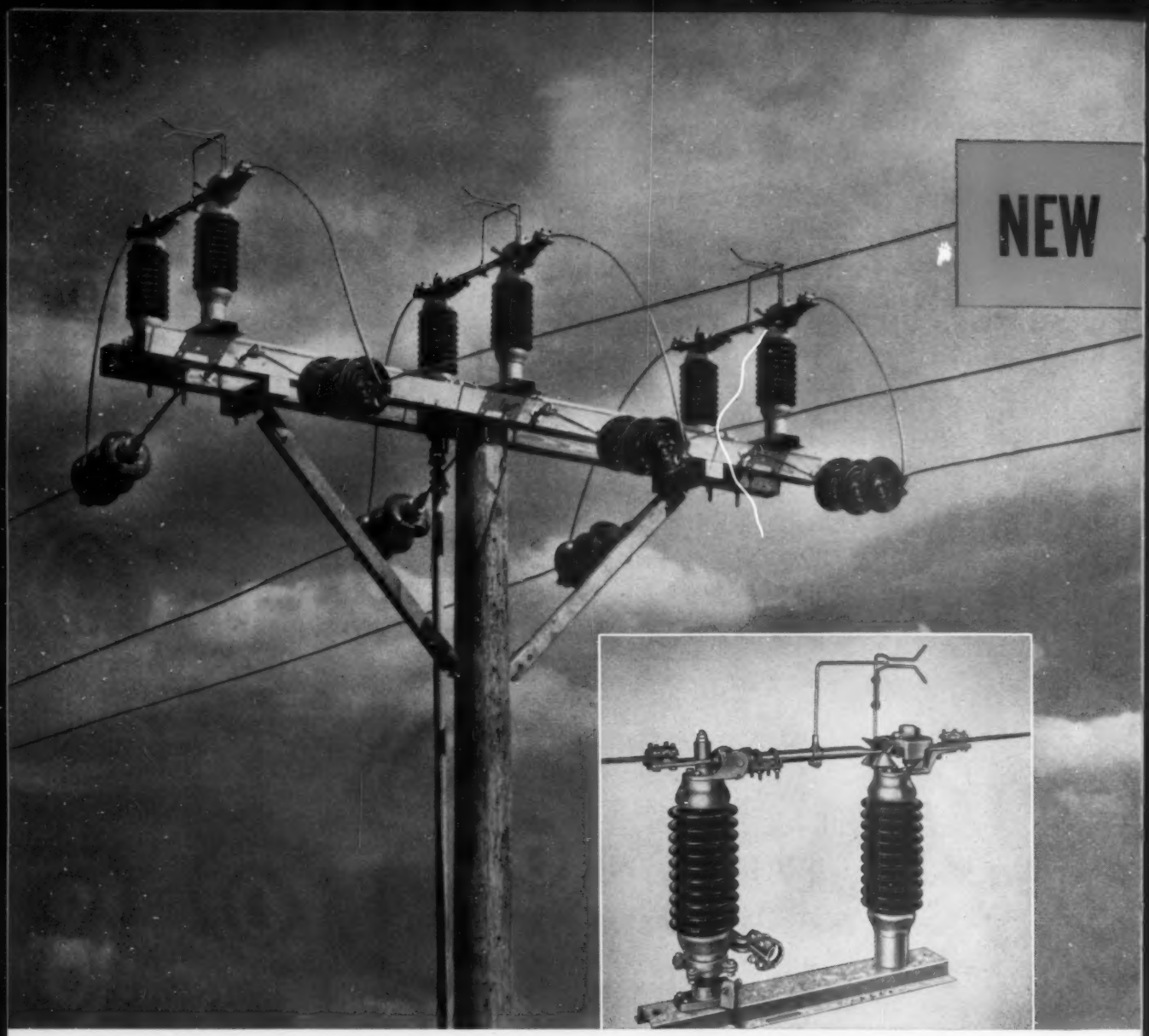
Contact your nearby Allis-Chalmers office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Originators of 5/8% Step Regulators

ALLIS-CHALMERS

Vari-Amp is an Allis-Chalmers trademark.

A-5858



NO OTHER SIDE-BREAK DISCONNECT GIVES YOU ALL OF THESE OPERATING ADVANTAGES

- **Correct contact always maintained at blade tip even if crossarm warpage distorts the switch base.**
- **All blades engage fully in the break-contact jaws without precise adjustment of the inter-phase rods.**
- **Less time and labor to install with Kearney original wide-tolerance mechanical design.**
- **Easiest, surest ice-breaking ability available on both opening and closing.**

This newest Kearney development solves long-existing operating problems of crossarm mounted group operated side-break disconnects. The best supporting structure or crossarm construction may . . . due to ice loads, age, wind or line strain . . . deflect enough to distort the switch bases, or alter the relative positions of the three phases. This often causes loss of contact or failure of all blades to close completely in conventional disconnects with both rigid blades and stationary break-contacts.

Kearney's advanced design features a self-aligning blade constructed to permit controlled vertical movement and axial rotation. This automatically compensates for base distortion . . . keeps the blade tip correctly aligned in the contacts. The break-contact swings 30-degrees with the blade as it is opened or closed, producing high leverage ice-breaking ability and full wiping of the silver current transfer surfaces. On closing, the blade tip fully engages the break-contact before the contact moves from its angular open position, compensating for any shift in position of the switch bases. This same feature also allows considerable freedom in interphase rod adjustment, enabling Kearney *Self-Aligning* side-break switches to be installed faster and more economically than other types.

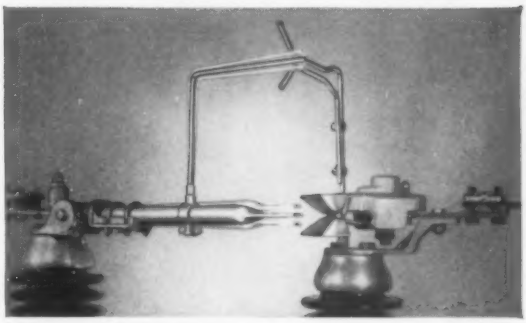
The details of these original features for maintenance-and-adjustment-free operation are shown on the facing page.

Kearney's

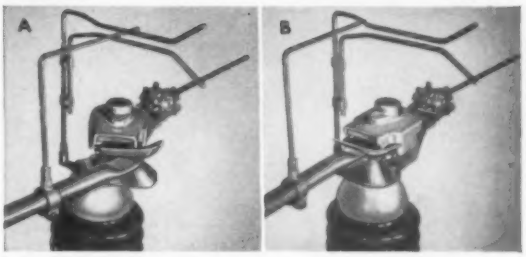
Self-Aligning SIDE-BREAK DISCONNECTS

...always make positive contact, even if the supporting structure warps, twists, bows or settles.

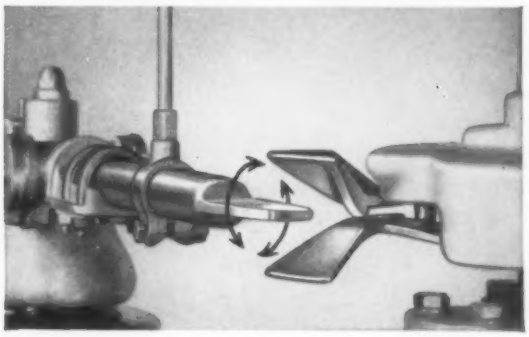
Self-aligning blade moves in a vertical plane to re-establish the original relationship between blade tip and contacts if supporting structure warpage distorts switch base. Wide mouth contact jaws assure blade entry into the contacts. Vertical 1¼" movement more than corrects for extreme cases of misalignment.



Break-contact swings 30° in the plane of blade travel as switch is opened or closed, providing highest leverage ice-breaking and full wiping of the current transfer surfaces. Note that the blade tip is fully engaged, and full contact is maintained (A) through the final 20° of blade travel to the fully closed position shown at (B). This feature allows more latitude in phase rod adjustment than other designs.



Blade rotates 12° on its longitudinal axis. If base distortion has affected blade-contact alignment, the blade tip will rotate as it enters the break-contact to keep all contact surfaces parallel, automatically restoring contact alignment. Friction reducing construction at all rotation points minimizes operating effort.



Switch carries full-rated load current well within NEMA temperature rise, from a fully closed position to 20° partially open position. Ratings available, 7.5 through 69 kv, 600 amperes. Equipped with conventional or whip-type arcing horns... torsional or spade-type operating mechanism. May be mounted horizontally, vertically, or underhung.

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• Instant-response tap changer

• Inverse-time relay • 1¼% steps"

This three-part arrangement provides the narrowest practical bandwidth and, hence, the best regulation for every system, under every voltage condition. Westinghouse URL and URF regulators, engineered with all practical limitations in proper perspective, combine (1) instant-response, geneva gear driven tap changing, (2) inverse-time relaying and (3) 1¼% steps.

Practical limitations on bandwidth

Theory may ignore practical limitations, but an engineer looking for peak performance cannot. For example, theory once held that very narrow bandwidths could be set because of the infinitesimal voltage changes possible with induction regulators. Experience proved otherwise, however, because system voltages do not follow a straight line trend. Closer relay band settings result in random voltage changes exceeding the band limits more frequently, causing increased regulator operations. This determines *practical* minimum bandwidth.

Reduced operations on narrow band setting

Bandwidth reduction results in more tap changer operations. For example: On a typical system, a bandwidth reduction from 3 volts to 2 volts, with no change in time-delay setting, caused increased operations for both a ⅝%-step and a 1¼%-step regulator. But even here, the 1¼%-step unit with inverse-time relay held operations to only 64% of those for the ⅝%-step regulator with 60-second fixed time delay.

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Conventional control systems using a balanced-beam type voltage relay usually require a holding voltage to minimize contact burning. This requires additional bandwidth in relay settings. The exclusive Westinghouse CVR relay requires no holding band—therefore, it is possible to set URL and URF regulators to bandwidths between 1½ and 2 volts, while retaining the advantages of 1¼% steps.

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J-70856

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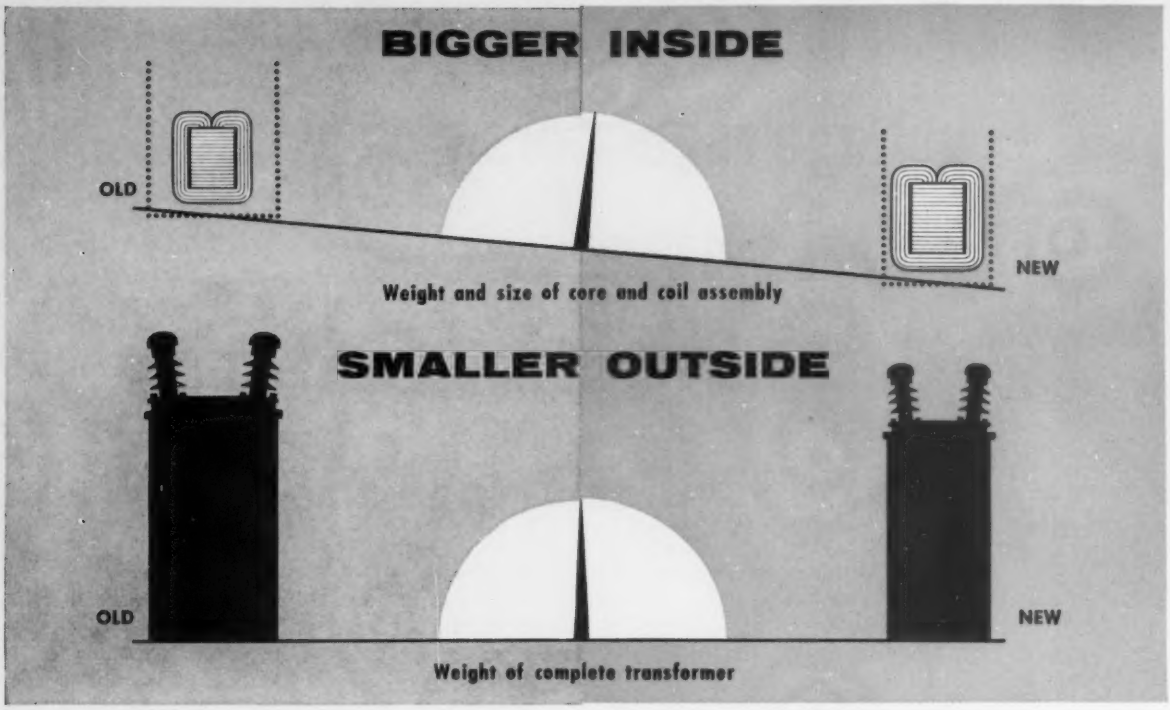
H. F. Barsun, Manager, Regulator Engineering, Westinghouse Electric Corporation, presents an engineering approach to narrow bandwidths.



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Distribution system protective

By Ted L. Hatcher
Texas Power & Light Co.
Dallas, Texas

This is the first of several articles adapted from a comprehensive discussion presented by the author at the recent Power Distribution Conference sponsored by the University of Texas' Electrical Engineering Department.

◆ THE RELATIVELY high cost of distribution system protective equipment that theoretically brings in no revenue has caused much concern to the electric utility engineer in this time of rising costs. There is no doubt that investment in distribution system protective equipment of the modern utility is a sizeable portion of the total distribution system investment. In spite of the growth of transmission and subtransmission, distribution still amounts to approximately 45% of the total electric utility investment. A review of the methods used in applying protective equipment to distribution seems appropriate if we are to continue providing adequate service to customers at little or no increase in cost.

This paper reviews some of the present methods used by the electric utility industry and outlines some of the present standard practices used by Texas Power & Light Company. It must be recognized that the problems in application of distribution system protective equipment vary among utilities and the procedures outlined herein will not apply to every utility. This paper will be limited to the general case rather than specific cases.

General considerations

Some of the general considerations that should not be overlooked in any one particular case are as follows:

(1) Service requirements
- Type load
  - Residential
  - Industrial
  - Commercial
  - Rural
  - Combination
- Special service requirements
- What the customer wants

(2) Protective requirements of equipment
- Prevention of line burndown
- Protection from damaging overloads
- Coordination of protective devices
- Restoration of service quickly in the case of temporary faults
- Provision of uninterrupted service during normal conditions
- Maximum safety to personnel and public

(3) Equipment limitation due to design
- Maximum interrupting capacity
- Maximum momentary current carrying capacity
- Maximum continuous load carrying capacity
- Accuracy of time-current characteristics
- Minimum operating current

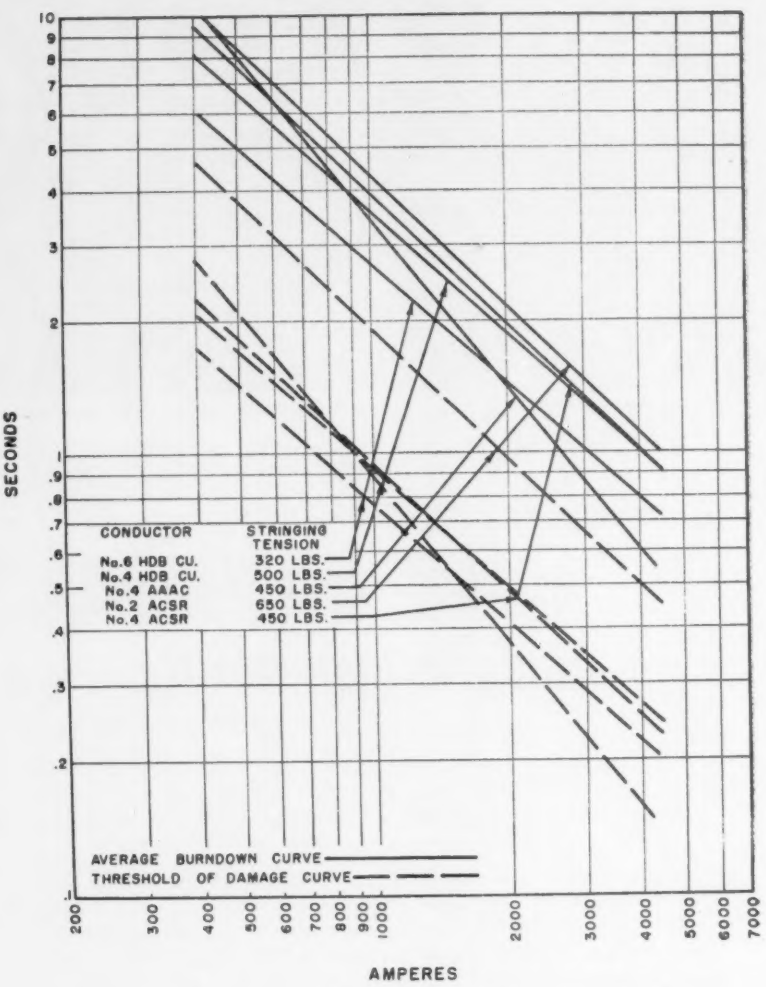


Fig. 1—Burndown and damage curves of bare conductors.

equipment application study

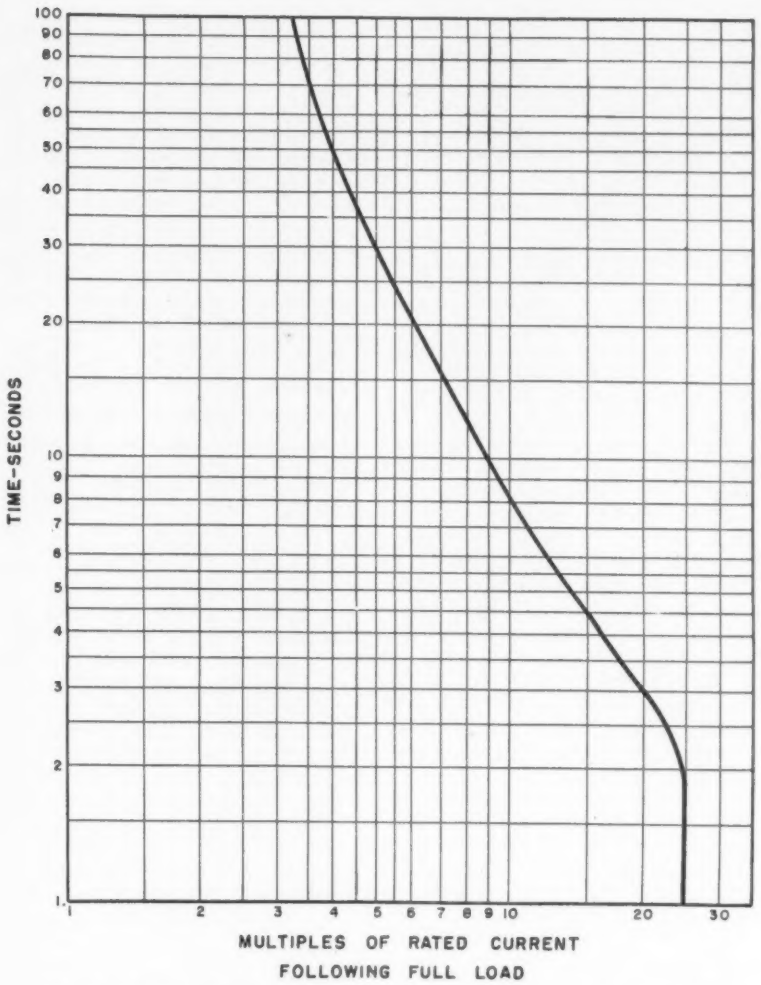


Fig. 2—Self-cooled transformer damage curve following full load.

Service requirements

The service requirements of any one given distribution system will vary depending on the type load to be served. For instance, it is not economically feasible to provide rural customers with the same class service as customers in an urban area. Also, some industrial customers require uninterrupted service; whereas, a few momentary interruptions are of little consequence when serving residential customers. Of course, long interruptions are objectionable to most any type load. The long interruption may be of utmost importance to industrial and commercial customers where production and sales are dependent on the use of electric energy. Even short interruptions may be objectionable to customers having critical loads.

As a city grows, customers living inside the city limits will move to suburban areas. If the service in these suburban areas is not comparable to the service inside the city limits, an increased number of complaints can be expected. Most residential customers are not aware of the vast amount of equipment and associated problems necessary to provide electric service; however, for some reason, they associate lightning with interruptions to electric power. It is difficult for the customer to understand the reasons for electric service being interrupted to them when they can see the people across the street have electric service. Any radical change in service reliability is quickly detected by the customers.

Protective equipment

Line burndowns result in extended interruptions, expensive replacements and safety hazards. Therefore, one requirement of the applied protective equipment is to protect against line burndown. When an arc is present, more damage can result from heating in the arc than heating in the conductor. The use of bare wire on primary distribution presumably has minimized this problem, and the use of steel reinforced conductor has been an additional aid in the solution of the problem.

The theory used in the conclusion that the use of bare wire will minimize conductor burndown is that the arc will travel, thus spreading out the heating due to the arc. On grounded wye systems, operating experience has proved that most faults are line-to-ground. The shortest path for line-to-ground faults caused by a high voltage impulse is at a pole where the hardware considerably reduces the air gap distance to ground potential as compared to the spacing in the span.

Recent tests shown in Figure 1 indicate that line-to-ground faults initiated at the pole result in little or no travel of the arc and that conductor damage may be more nearly a function of $I \times t$ rather than $I^2 \times t$. The conventional heating approach to line burndown problems on bare wire will have to be revised to take into account this relationship provided additional tests prove more definite conclusions.

The practice of thermal loading of substation transformers along with more adequate information on

transformer damage due to overload has caused more emphasis to be placed on protection from damaging overloads. Figure 2 shows the damaging time-current characteristic of a typical substation transformer. This factor has to be considered when applying distribution protective equipment at substations.

Figure 3 shows a typical distribution feeder sectionalizing scheme. Oil circuit breakers, reclosers and fuses in most instances are installed to isolate faulted sections and reduce interruption time to other customers on the system as well as provide protection to equipment. Thus, there must be coordination between each piece of equipment to perform the whole function for which they are installed. This is desirable during both normal service and the condition when a device fails to operate.

There are some instances when damaging overloads may result from excessive load rather than faults. This may be the case when the load of one substation is tied onto the distribution feeders from another substation. In these cases, service reliability must be weighed against possible damage to equipment when applying overload protective devices.

Other requirements of protective equipment are that maximum personnel safety must be maintained, uninterrupted service should result during normal load conditions, and service should be restored as quickly as possible in the case of temporary faults.

Equipment limitations

In the application of any one distribution protective device, the specific design ratings must be examined to see that the device will perform the desired functions at the proposed location. It must have an interrupting capacity adequate to interrupt the maximum expected fault current. There must be sufficient momentary current carrying capacity to withstand the excessively high charging current in the case of shunt capacitor installations, and the continuous current rating must be equal to or more than the maximum expected load.

When many devices are to be applied in series, accuracy of the time-current characteristics will be an important factor in the degree of protection that can be obtained. In most all cases, minimum operating current will be a feature of special significance. The reliable life of equipment also should not be overlooked.

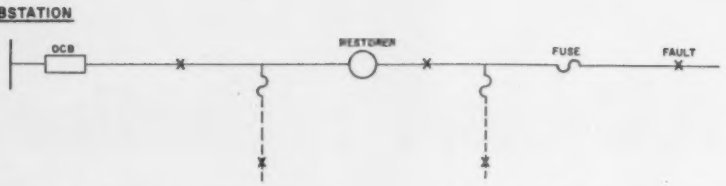


Fig. 3—Typical sectionalizing scheme on radial distribution feeder.

Application of equipment

Since the earliest form of electric power system was the generating station and primary distribution system, one might expect that the art of protecting primary distribution would be developed to the highest degree. However, more emphasis has been placed on the protection of higher voltage equipment due to the higher cost. The original weak link, or fuse, remains one of the most used pieces of overcurrent protective equipment on primary distribution systems today. Although other equipment is available, the three major devices used for distribution overcurrent protection are oil circuit breakers, using overcurrent relays, service restorers, and fuses in the order of descending cost.

There have been in recent years two concepts of coordination for the typical 4.16 kv or 12.5 kv grounded wye distribution feeder serving residential and/or commercial load. One concept is to provide at the substation a sensitive ground relay with a very fast operating time, similar to the fast trip normally provided on a service restorer, which will trip the substation oil circuit breaker for almost any phase-to-ground fault on the distribution system. After an instantaneous reclosure of the substation oil circuit breaker, this relay is prevented from energizing the trip circuit again until the oil circuit breaker has remained closed for a predetermined time, allowing a second ground relay with longer time to operate for coordination with fuses and service restorers. This approach to feeder coordination has the advantage of a reduction in primary fuse replacements.

A second concept of distribution feeder coordination is to provide only the time delay phase and ground overcurrent relays at the substation. This approach to feeder coordination has the advantage of fewer outages to most of the customers, as tripping of the feeder OCB is minimized.

The choice of one of the above concepts of feeder coordination will of necessity have influence on the type and rating of some of the equipment to be applied to distribution systems.

(A continuation of this discussion will appear in the April issue of ELECTRICAL SOUTH.)

System power factors pushed toward unity

◆ THE RATIO of installed capacitor kilovars to peak-load kilowatts in the United States increased from .38 at the end of 1957 to .40 at the end of 1958, according to W. G. Hart, manager of power capacitor sales for General Electric.

Although installed kilovars did not increase at the same high rate as in previous years, Hart said the increase indicates that more utilities are becoming aware of cost reduction opportunities afforded by capacitors, and that there is a general trend to push system power factors toward unity.

He pointed out that 1958 saw capacitor prices reduced to an average of $4 to $6 per installed kilovar, and that now, more than ever, capacitors represent a utility's best buy in electrical apparatus.

Based on current prices, Hart stated, capacitors will yield an investment return of approximately 30% in terms of loss reduction alone.

Hart said 1958 also saw:

(1) A continued trend toward the use of factory-assembled capacitor equipments.

(2) Lighter weights and higher ratings—up to 1200 kvar—for pole-top equipments.

(3) Increased use of a capacitor and protective gap in series with a distribution transformer to make the transformer self-regulating.

(4) Greater emphasis on corrosion-resistant, maintenance-free materials for capacitor cases and racks.

Transformer pole standards are improved

By C. K. Jones

Overhead Engineer,
City Public Service Board
San Antonio, Texas

◆ "SAFETY" with special emphasis on over-all costs is uppermost in the minds of our engineering and construction personnel in the design of our overhead construction standards. Before a standard is approved for use—a preliminary drawing is made incorporating the new idea or change, and the standard is actually put up on a demonstration or training pole.

Each general foreman inspects the installation and makes suggestions, and he in turn secures suggestions from the line foreman and linemen for any changes or betterments. All ideas are considered with care before the final standard is drawn up and approved. The linemen feel, with some pride, that they are partners in a program which is for their benefit as well as for others.

This process was utilized in the preparation of our newest transformer standards, now in use, which we feel are particularly satisfactory. The drawings show two perspective views of a single-phase 7.9 kv to 120-240 volt transformer installation.

The first view, Fig. 1, shows the transformers mounted on one quadrant of the pole. The other view shows cut-out and lightning arrester mountings and the climbing clearances.

The outstanding features of this installation are as follows:

(1) Ample climbing clearances. Note that Fig. 2 shows entire side of pole clear.

(2) Only 7′ - 5″ of pole used for electric utilities. This allows the use of a 35′ Class 5 pole in alleys for joint use by telephone company.

(3) Secondary wires and service not disturbed when installing transformers. Only services on side of pole where transformer is mounted have to be changed.

(4) Brackets made by use of two 24″ double arming bolts and a treated wood member mounted

(Continued on page 120)

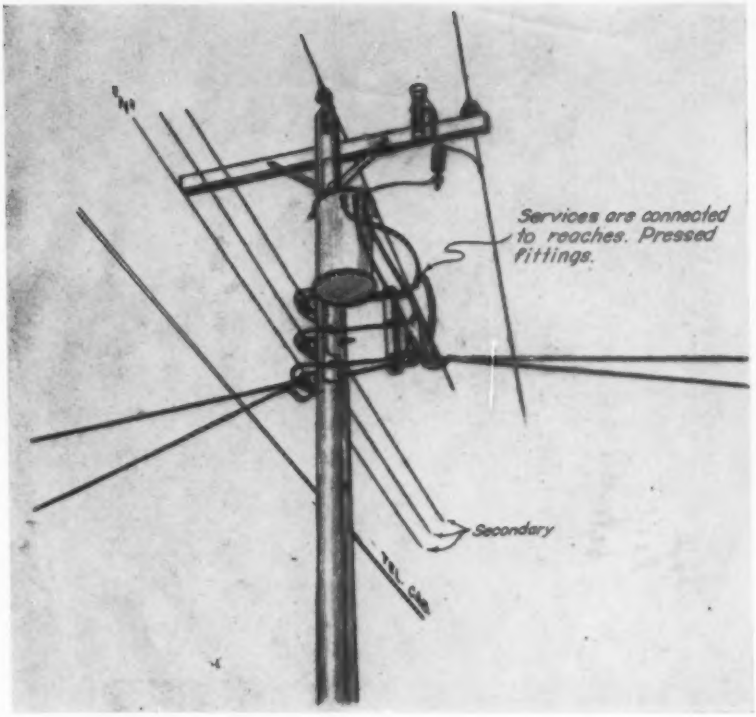


Fig. 1—This view of the transformer standard construction developed by City Public Service Board, San Antonio, shows how transformer is mounted in a single quadrant of the pole.

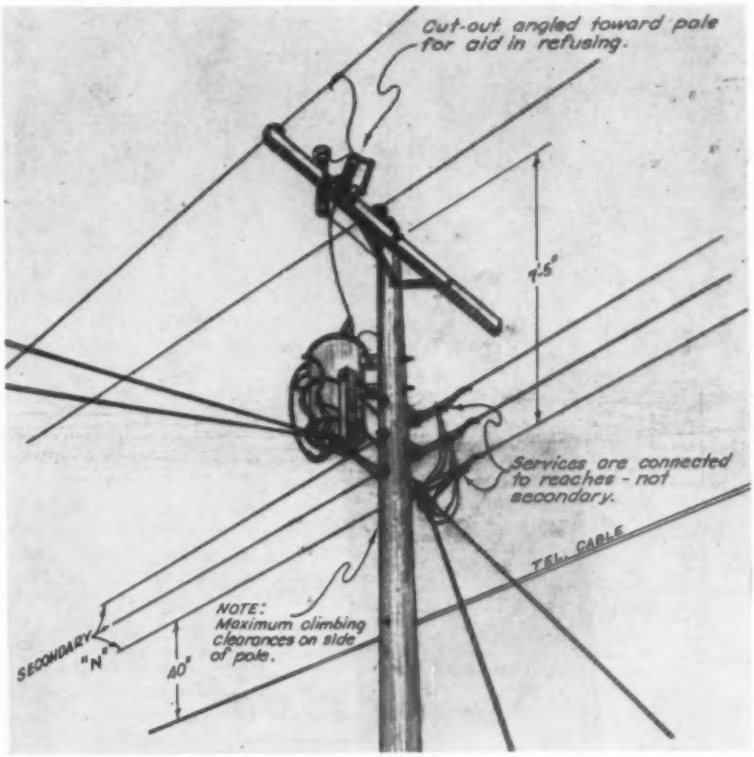


Fig. 2—An opposite view shows details of cut-out and lightning arrester installation. Cut-out is angled toward pole to aid fusing.

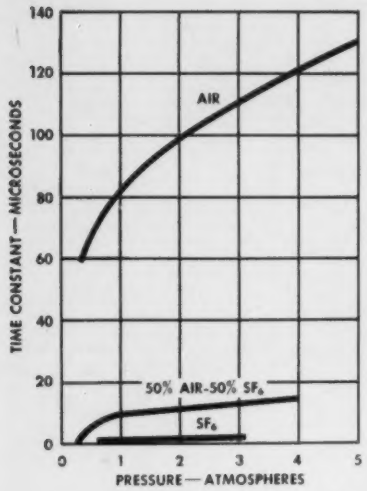


Fig. 1—Time constant curve for sulfur hexafluoride under plain-break conditions.

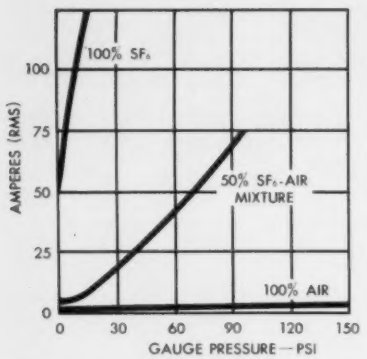


Fig. 2—Interrupting performance of a 3-inch plain-break gap in SF_6 at 2300 volts.

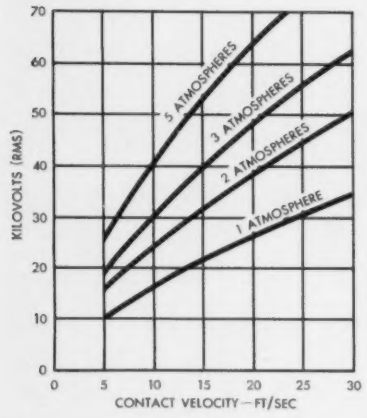


Fig. 3—Calculated voltage limits for restrike-free interruption by a plain-break arc in sulfur hexafluoride for capacitor switching at currents of 150 to 350 amperes.

Circuit interruption

By R. E. Friedrich

Mgr. Circuit Breaker Development
Power Circuit Breaker Dept.
Westinghouse Electric Corp.

◆ SULFUR HEXAFLUORIDE is new in the circuit-interruption field but several years of successful service experience have already been obtained. Load - break switches have been in service since 1953, and several 1000-mva, 115-kv circuit breakers have completed two years service experience. Some 46-kv reclosing circuit breakers have recently been installed, and the first 15,000-mva, 230-kv breaker will be installed in mid 1960.

The favorable characteristics of SF_6 — unusual arc interrupting ability, freedom from carbon, and high dielectric strength—are making possible new breaker designs that can combine the better features of both insulating-oil and compressed-air circuit breakers. Sulfur hexafluoride has given circuit breaker engineers a new degree of flexibility in circuit breaker design.

The requirements of a high-power arc-interrupting medium are difficult to fill. Only two mediums — air and oil — have proved universally acceptable over the first half century of circuit breaker development. Sulfur hexafluoride gas, long known to chemists but only recently exploited by circuit breaker designers, bids to become the third major arc-interrupting medium.

Sulfur hexafluoride was first developed and applied as an insulating medium. At atmospheric pressure, the gas has a dielectric strength two to three times that of air, and its dielectric strength increases with increasing pressure; at three atmospheres, its dielectric value is approximately that of transformer oil.

However, good as its insulating qualities are, circuit breaker designers feel that the real value of sulfur hexafluoride lies in its unique arc-quenching ability — which under some conditions is 100 times better than air!

Sulfur hexafluoride is one of the halogen compound gases, is extremely stable and inert, and remains a gas down to a comparatively low temperature (-62 degrees C at atmospheric pressure). It is nontoxic and nonflammable. The gas is odorless and colorless, with a density approximately five times that of air.

Fundamental explanation

Although a fundamental explanation for the a-c arc-quenching effectiveness of SF_6 gas still lags somewhat behind its application, significant progress has been made to develop an adequate theory. The phenomenon that apparently explains the superior arc-interrupting abilities of sulfur hexafluoride, is the effect of negative ion formation by electron capture on electric discharges.

Certain molecules offer an attraction for free electrons, and combine with the electrons to become negatively charged ions; gases made up of molecules with this electron-attracting characteristic are known as *electro-negative* gases. Sulfur hexafluoride is one of the best electro-negative gases. When the electrons are captured, SF_6 and SF_5 ions are formed, and both are massive and therefore relatively ineffective as current carriers.

Both the insulating and arc-quenching abilities of SF_6 are strongly affected by this electron-trapping action; however, the mechanism in electric breakdown and arc-quenching is so different in detail that the quantitative effects observed are quite different —whereas sparking voltages in SF_6 are only about 2.4 times those in air, plain-break contacts drawing 60-cycle arcs in SF_6 can interrupt 100 times more current than in air at a given voltage.

The basic requirement of an a-c arc-interrupting medium is not primarily high dielectric strength, but rather, a high rate of recovery of dielectric strength; this requirement can be alternately expressed as a high rate of loss of arc-path conductance as the alternating current passes through zero. This rate

with sulfur hexafluoride gas

of change in conductance is generally measured in terms of the *time constant* of the medium. The extremely fast capture of free electrons in the arc path through the electro-negative process is believed to explain the extremely low time constant of SF_6, only a fraction of that for air (Fig. 1). This points out a striking correlation between the relative values of time constant and arc-interrupting ability.

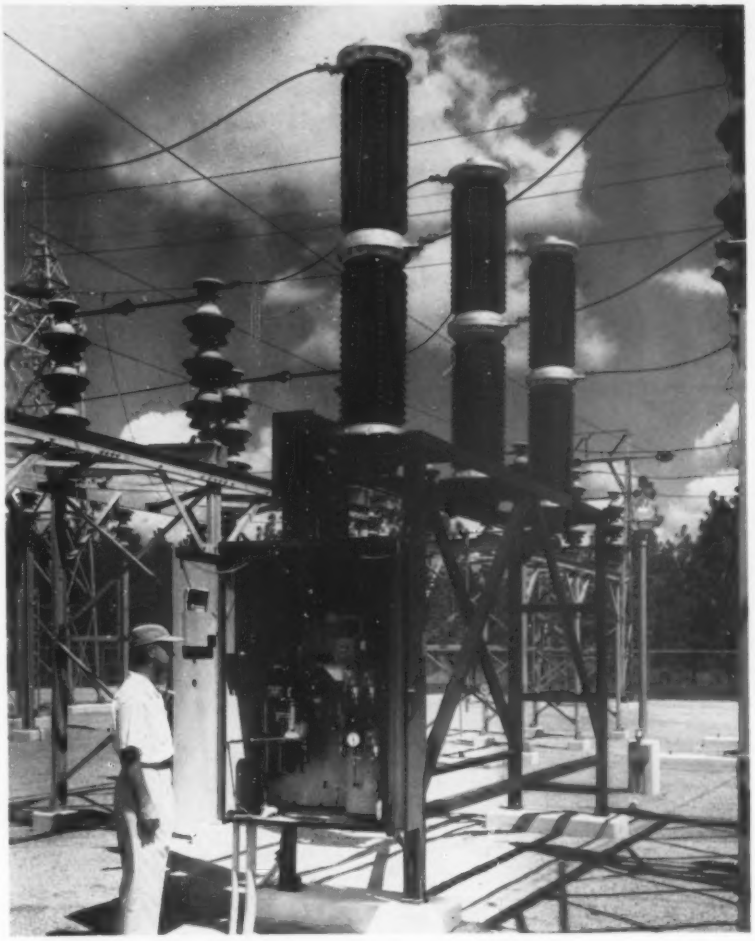
Arc interruption

The role of sulfur hexafluoride as an arc-interrupting medium can perhaps be best explained with a qualitative description of the arc-interrupting process. The phenomenon is rather complex, but can be most clearly described by dividing the process into two phases—an *energy-balance state* in the arc column immediately preceding a current zero, and a *dielectric recovery period* immediately following current zero.

In the energy-balance state, the arc must provide a low-impedance path for current flow until a normal current zero is reached. While the arc is a current-carrying conductor, it must operate in a relatively stable state; this means that current must be controlled by the connected circuit rather than by the arc. However, arc power should reduce at a rate approximately proportional to decreasing arc current. If the interrupting medium is to aid arc extinction, it usually serves to increase the rate of energy loss from the arc column.

The ability of SF_6 to respond extremely rapidly to changing conditions makes it possible to reduce the arc diameter proportional to falling current magnitude with a relatively small flow of gas through the arc. The arc power should be reduced to a point where the arc loses stability just before a normal current zero.

On the other hand, if arc stability is lost prematurely, thereby forcing a current zero (arc chopping), extremely high voltage transients can result in connected inductive circuits.



This gas filled (SF_6) power circuit breaker, installed on the system of a Florida utility company, operates at 115 kv and is rated at 1000 mva. It has a continuous current rating of 400 amperes rms, and will interrupt current in 5 cycles and reclose in less than 15 cycles.

If the arc is to be quenched, the arc path must change quickly from a good conductor to an insulator to prevent restriking due to the rising voltage across the interrupter. In this period immediately following arc quenching, dielectric strength of the arc space is at first far below its ultimate value because of the high temperature and consequent low density of the gaseous arc residue. The ability to build up dielectric strength in this recovery period sets the upper voltage limit for breakers interrupting line-charging, magnetizing, or normal load currents where the rate of rise of circuit recovery voltage is relatively low.

However, when quenching high-current arcs, actual arc interruption depends upon the outcome of a continued dynamic energy balance after current zero. Some residual conductivity exists in the incompletely-deionized arc space, through which the rising recovery

voltage sends a small post-arc leakage current. If the arc is to be extinguished, the energy input into this path must not increase ionization and conductivity faster than the losses from this space can take energy away.

The low time constant for conductivity change in arc spaces in SF_6 is a tremendous advantage in effectively quenching high-power arcs. After the leakage current disappears, the gap dielectric strength must still build up sufficiently rapidly to withstand the crest of the transient recovery voltage.

Decomposition of SF_6

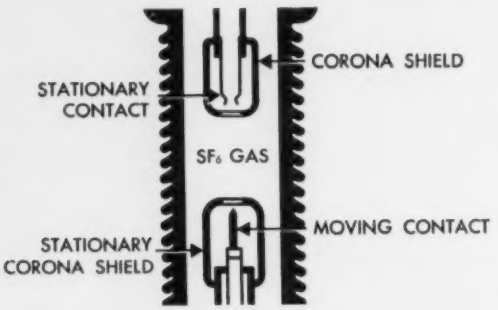
Studies of the decomposition of SF_6 due to arcing indicate that even in high-power breakers, many interruptions at maximum short-circuit duty can be made without serious loss of gas through decomposition. At atmospheric pressure, more than a hundred high-power interruptions are required to decompose a cubic foot of sulfur hexafluoride gas. The rate of decomposition is a function of arc energy, but is relatively low due to the fact that much of the decomposed gas immediately recombines to SF_6.

The gaseous decomposition products are chiefly lower fluorides of sulfur, such as SF_2 and SF_4. Although these gases are not toxic as such, they are unstable and easily hydrolyze in contact with atmospheric moisture to form sulfur dioxide and hydrofluoric acid. The highly toxic S_2F_{10} has never been observed in arc-formed decomposition products.

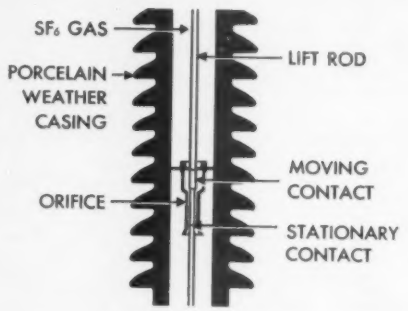
Therefore, even though the presence of some air or even moisture does not appreciably effect the interrupting ability of SF_6, decomposition products formed during arcing can be minimized by using pure SF_6. In addition to using pure SF_6, a few pounds of activated alumina in the breaker chamber not only absorbs gaseous decomposition products, but also assures gas dryness.

The fear of possible corrosive affects of the decomposition products has been a deterrent to the use of SF_6 for arc quenching. However, effective breaker sealing and the use of activated alumina has made the problem much less serious than might have been anticipated.

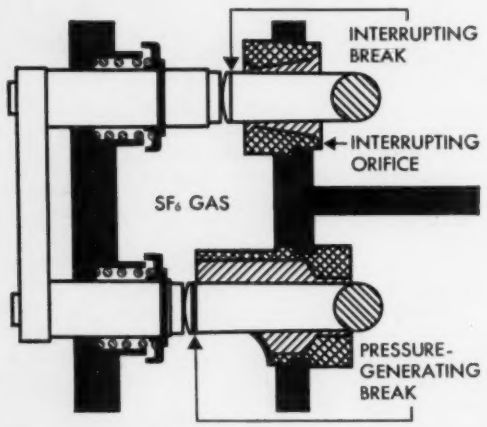
In addition to the active gases,



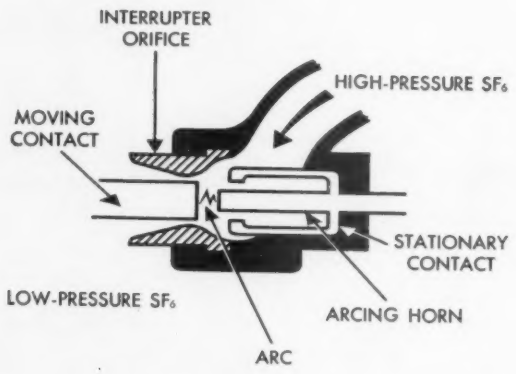
(a) Plain-break interrupter developed for high speed grounding switch. Contacts operate in SF_6 gas under pressure of about two atmospheres.



(b) Load-break switch employs piston and Teflon orifice on moving contact to force un-ionized gas through the arc formed during contact separation.



(c) Power circuit breaker uses two arcs in series. Expansion of gas due to arc at lower contact forces flow of gas through the orifice of upper contact.



(d) In the highest power sulfur hexafluoride interrupter, high pressure gas is forced through the interrupting orifice as the contacts separate.

Fig. 4—Four types of SF_6 arc interrupters are illustrated by these simplified diagrams.

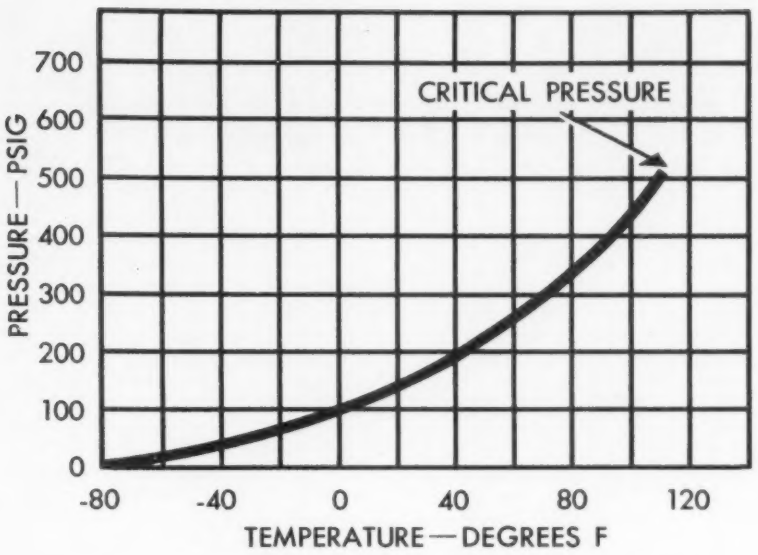


Fig. 5—Pressure-temperature relationship for sulfur hexafluoride.

some metallic fluorides are formed from reaction with the breaker contacts during arcing. These fluorides, which distribute themselves as a fine powder throughout the breaker chamber, have high resistivity and therefore cause no electrical trouble. Breaker contacts are designed with a "wiping" action to prevent accummulation of these insulating particles on current-carrying surfaces.

The complete absence of carbon in sulfur-hexafluoride is a major advantage for an arc-interrupting medium. For example, oil-breaker mechanisms must be carefully designed to avoid horizontal insulating surfaces where conductive carbon compounds can settle. The complete absence of arc-formed conductive compounds in SF_6 permits more freedom in structural design.

Breaker design

Because of its cost, SF_6 is not discharged to atmosphere as in air-blast breakers. Instead, SF_6 circuit breakers are completely sealed and self-contained units. Although some sealing problems are introduced, the resulting benefits largely offset the added difficulty and cost of sealed construction.

For example, an obvious benefit is the complete absence of flame, and also a considerable reduction of noise, even on high-power short-circuit interruptions. Sealed construction also avoids moisture-laden air and consequent condensation, which would have deleterious effects of corrosion and increased electrical leakage over insulating surfaces.

The first breakers developed were porcelain enclosed. However, in the latest design, a 230-kv, 15 000-mva breaker, designers have gone to the all-steel, dead-tank construction of oil breaker designs.

Although pressure-tight sealing of SF_6 breakers was at first a problem, satisfactory solutions have been found. In the first commercial SF_6 interrupter, the type VLB load-break switch, only a few cubic feet of gas were contained in the arc chamber, so that even a small leak could reduce pressure rapidly.

During the development of these interrupters, one of the most troublesome problems was diffusion of gas through gaskets and porous castings. The difficulty was eliminated by impregnating all castings with a thermo-setting resin, and sealing the breaker with a silicone rubber gasket.

With this construction, the interrupters operated satisfactorily in the field for a number of years, but eventually some pressure loss was observed. This resulted in the development of a new gasket of low-temperature Neoprene compound, which has a permeability of less than one per cent of the silicone gasket.

Interrupting mechanisms

Structural members of the interrupting mechanism can be of any material of adequate electrical and mechanical strength. However, organic insulation, such as fibers or Micarta, should not be located in the arc path where it can be decomposed to avoid diluting the gas with undesirable impurities. Interrupting orifices are usually constructed of Teflon, which is extremely resistant to arcing and produces negligible gas contamination.

The interrupting arrangements employed on sulfur hexafluoride devices range from simple plain-break contacts to a gas-blast design. Because of the superior arc-interrupting ability of SF_6, the necessary gas flow in the interrupting orifice is relatively small. Generally, the required flow-producing pressures for arc extinction are only one-third to one-half the values required when air is the interrupting medium.

For low-power interrupting application, or capacitor switching, plain-break interrupters are effective; flow-type breakers are required for higher power interrupting duty. Gas flow can be produced by: a mechanical piston or puffer; thermal expansion of the gas by an auxiliary arc; or by discharging gas under pressure through the arc path.

A high-speed grounding switch employs a simple plain-break contact (Fig. 4a). Actually, this switch is a contact *making* rather than a *breaking* device, and SF_6 reduces arcing time during closing.

A puffer technique was effectively employed in the SF_6 load-interrupting (type VLB) switch. The interrupting orifice is combined with a piston on the moving contact, so that gas compressed is forced through the orifice (Fig. 4b).

For the 115-kv, 1000-mva and 46-kv, 250-mva circuit breakers, a double-break arrangement is used in which a pressure-generating break provides flow-producing pressure to force gas through the orifice surrounding the interrupting break (Fig. 4c).

In the highest interrupting rating developed to date, a 15,000-mva, 230-kv circuit breaker, SF_6 at nominally 170 psi above tank pressure is discharged through the interrupting orifice (Fig. 4d).

Economics and use of SF_6

Although SF_6 is normally a gas, it can be liquefied at moderate pressures and stored as a liquid at its vapor pressure, in much the same manner as carbon dioxide.

(Continued on page 118)

Guide to regulator loading

By Howard C. Brem
and Robert A. Studer

Regulator Department
Allis-Chalmers Mfg. Co.

This is the fourth of a series of six articles on the subject of voltage regulator applications. Other articles in the series discussed economic considerations, kva ratings, special applications.

◆ DESIGN FACTORS and the operating limitations of regulator components must be considered in detail to determine permissible overloading. Expansion of oil presents one limitation because of the pressure developed in sealed type units. With increased loading, temperature increases and pressure is built up. Heavy loading conditions can cause a considerable internal pressure, blowing out gaskets and possibly causing other damage to the equipment.

Bushing capability also enters into the picture as considerable overloads can exceed the bushing capability.

Control leads present another limitation as they are designed for a particular current. Excessive overloads could damage the leads, especially on older types of equipment with soldered connections.

Also, since increased torque accompanies increased loading on induction regulators, damage can result to the driving mechanism as a result of heavy loading.

Control equipment has voltage as well as current limitations since each regulator has its own control equipment including current transformer and line drop compensator.

The thermal limit of the winding must be considered for overloading purposes, for with excessive loading higher temperatures are produced.

The authors have presented this information in form of chalk board talks from which the accompanying illustrations have been selected.

Associated equipment in the station such as reactors, circuit breakers, disconnect switches, cable, current and potential transformers, also determine the practical loading limit of the regulator circuit.

A tap changing mechanism is designed for a definite current carrying ability. Heavy loading on the mechanism will result in additional maintenance, and the contacts, when heavily overloaded, will require additional attention. If regulators are operated above their rated kva at frequent intervals, they should be inspected more frequently, especially if the overloading has exceeded 150 per cent.

These then are the major limitations that must be considered in overloading. Manufacturers can be consulted on their specific design when severe overload applications are made.

Operating overload guides

It is almost axiomatic that regulator equipment be subjected to overloads at one time or another. There are various guides by which regulators may be overloaded provided they stay within prescribed limitations. One loading method is by measuring hottest spot temperature.

LOADING - TOP OIL TEMPERATURE

TOP OIL TEMPERATURES °C	°F	TIMES RATED KVA
35	95	1.99*
40	104	1.88*
45	113	1.77*
50	122	1.66*
55	131	1.54*
60	140	1.42
65	149	1.29
70	158	1.15
75	167	1.00

Figure 1

As long as the hottest spot temperature is not greater than 95 C at any time, the regulator can be loaded above its rating for any length of time. This is based on the 55 C temperature rise for which present day regulators are designed.

The 95 C temperature limitation is based on the total of 30 C average ambient; 55 C average copper rise, and 10 C hottest spot copper rise. As long as 95 C is not exceeded there will be no loss of insulation life expectancy.

Figure 1 gives another loading guide based on top oil temperature. As long as it does not exceed 35 C, the regulator can be operated 1.99 times its rated kva. As top oil temperature increases, the loading must be decreased to prevent loss of normal insulation life. However, because of the large variations in the difference between hottest spot copper and the top oil temperatures under full load, oil temperatures alone should not be used as a guide.

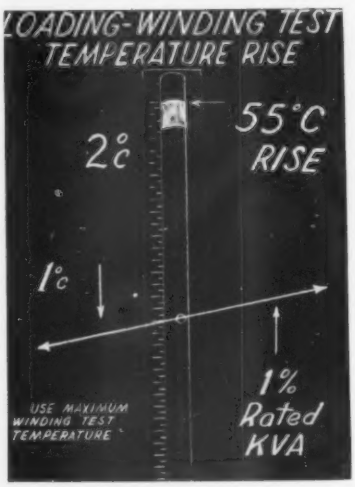
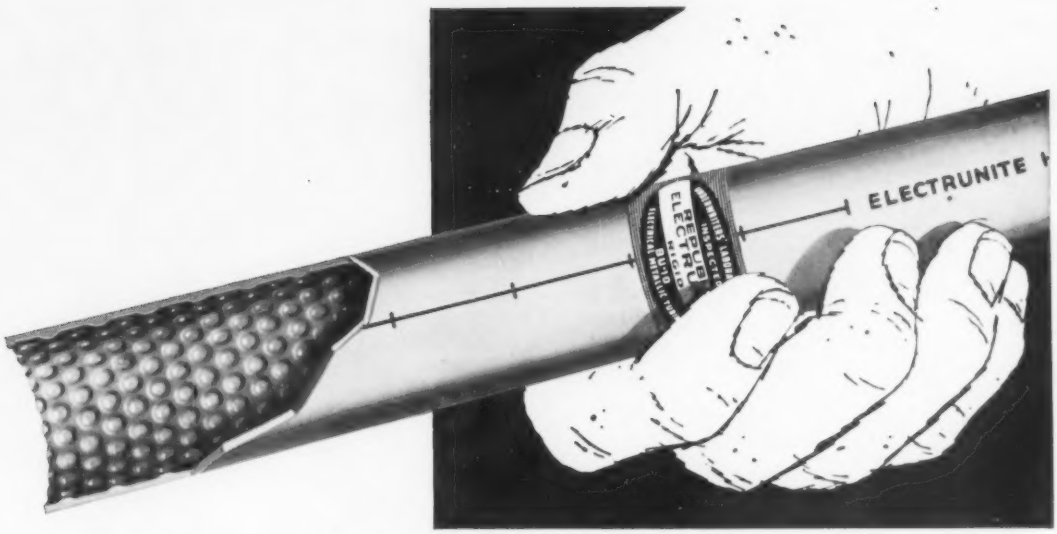


Figure 2

An asterisk in Figure 1 indicates that all the limitations mentioned previously must be considered at any time that operation is above 1.5 times the regulator's rated kva. For example, if the top oil should get as high as 75 C (167 F) the



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regulator should not be operated in excess of its normal rated kva to maintain its normal life expectancy.

When convenient to determine the winding test temperature rise, the operator can be governed by the guide in Figure 2. After allowing a 2 C cushion, the regulator can be operated 1 per cent more than its rated kva for each 1 C that the temperature rise is below the normally allowed 55 C rise. The two degrees C allows for some tolerance in the temperature measurement.

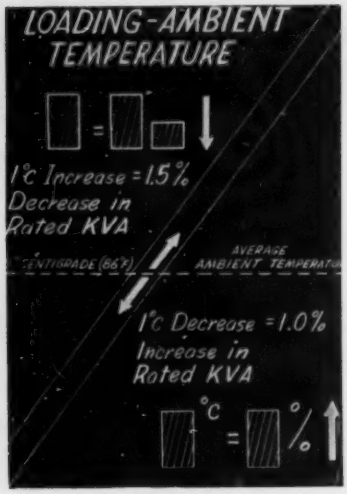
LOADING-AMBIENT TEMPERATURE
1°C Increase = 1.5% Decrease in Rated KVA
AVERAGE AMBIENT TEMPERATURE
1°C Decrease = 1.0% Increase in Rated KVA
°C = %

Figure 3

The guide shown in Figure 3 using ambient temperature is based on an average ambient temperature of 30 C. Where the ambient temperature is below 30 C (86 F), be guided as follows: for each 1 C increase above 30 C, the regulator load must be decreased by 1.5 per cent of its rated kva.

However, if the temperature is below the 30 C ambient, for each 1 C decrease, the regulator load can be increased above its rated kva by 1.0 per cent.

In other words, as the temperature goes above the 30 C average ambient, loading must be decreased more than it is increased when temperatures are below the average 30 C ambient. Operation is thus always restricted to safe values.

Where the load factor, not exceeding 24 hours, is below 100 per cent, maximum regulator loading for a like period may be increased above rated kva by 0.5 per cent for each per cent below 100. In Figure 4, for example, with an 80 per cent load factor for a period of six hours, the maximum the regulator could be loaded for six hours would be 110 per cent rated kva with no loss of normal insulation life expectancy. However, the maximum increase should not exceed 25 per cent.

Initial loading

Initial loading of a regulator also has a bearing on the final effects on insulation life. Initial load is that condition which must be continuous long enough for the regulator to reach a constant temperature.

For general guidance, following an initial load of 90 per cent, a regulator wil have a normal life expectancy if it is operated for half hour periods at no greater than 1.59 times its rated kva. It can also be operated as much as eight hours with an overload of 106 per cent.

Figure 5 gives limitations following initial loads of 90, 70, and 50 per cent. As initial loading decreases, it is possible to increase the loading. As noted by the asterisk in Figure 5, the original design limitations must also be considered when loading above 1.5 times rated kva. Normal life expectancy is maintained under all of the outlined conditions.

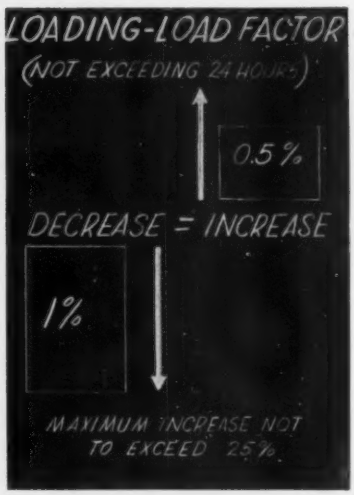

Figure 4

It is natural to expect that overloads above the previously outlined limitations for longer periods of time cause some loss of normal insulation life. The first analysis, shown in Figure 6, covers 50 per cent initial loads for short time loading. This results in moderate sacrifice of the insulation life.

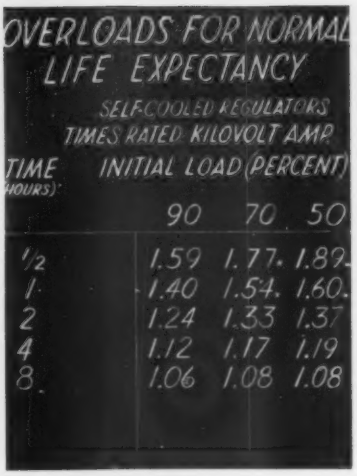

Figure 5

As the loading is increased, there is a greater loss of insulation life expectancy. The scope of the guide is shown by the loss of insulation life being either 0.1 or 1.0 per cent for 200 per cent loading for one half hour periods. A 200 per cent load should be considered as the absolute maximum.

Loading time must also decrease as the load increases to prevent excessive loss of insulation life. In analyzing the guide for 100 per cent initial load for short period loading, shown in Figure 7, insulation life loss becomes greater. Note that for 1/2 hour periods, the life loss is 0.1 per cent for loading of 1.75 times its rated kva, and also the life loss is 1.0 per cent when the maximum 2.0 times its rated kva or 200 per cent loading is applied.

With the one hour period, the life loss is 0.1 per cent at 1.54

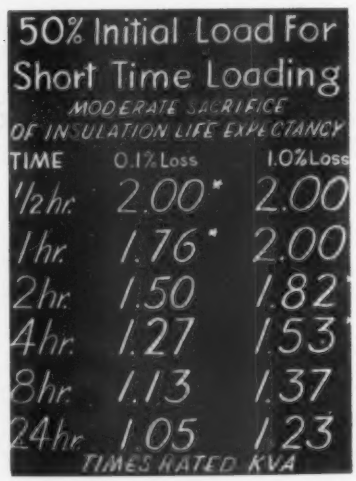
50% Initial Load For Short Time Loading
MODERATE SACRIFICE OF INSULATION LIFE EXPECTANCY
TIME 0.1% Loss 1.0% Loss
½ hr. 2.00* 2.00
1 hr. 1.76* 2.00
2 hr. 1.50 1.82*
4 hr. 1.27 1.53*
8 hr. 1.13 1.37
24 hr. 1.05 1.23
TIMES RATED KVA

Figure 6

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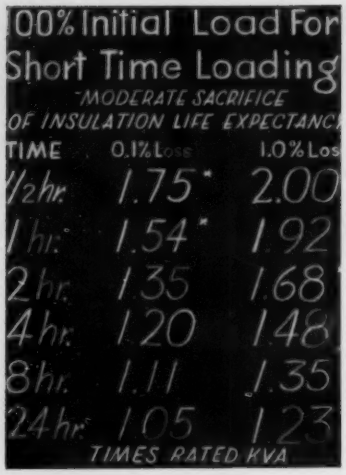

Figure 7

times the rated kva, and the life loss is 1.0 per cent when operated at 1.92 times rated kva. However, for longer periods of time, like 24 hours, notice that the loading and life loss is the same as that following 50 per cent initial load.

In both the 50 and 100 per cent initial load charts, asterisks follow any loading in excess of 1.5 times the rated kva. This spotlights the need to consider the original design limitations as far as oil expansion, pressure, bushing capabilities, leads, connections, thermal rating of the winding, tap changers, control equipment, and thermal capabilities of the associated equipment are concerned.

To summarize any regulator overload problem, list the information required to answer the questions, "How much can I overload my regulator?":

	Data available from: Utility	Mfg.
Regulator rating	X	
Regulator serial number	X	
Delivery date	X	
Oil expansions and pressures		X
Bushing capabilities		X
Leads and soldered connections		X
Thermal rating of winding		X
Tap changer		X
Control equipment		X
Torque (induction)		X
Contact burning		X
Thermal capability of associated equipment	X	
Measured hottest spot temperature	X	
Top oil temperature rise	X	
Test copper temperature rise	X	
Ambient temperature	X	
Load factor	X	
Short time loads	X	

The appraisal of the previous engineering data clearly indicates that both the regulator user and regulator manufacturer can coordinate their knowledge to result in a practical working guide for overloading.

Suggests sharing computer programs

◆ BASIC DIGITAL computer programs for analyzing problems on electric utility systems have been offered to the industry on a share basis by Westinghouse Electric Corporation.

In making the announcement, J. K. Dillard, manager of the company's electric utility engineering department, said, "We believe that maximum benefit to the industry can be obtained by establishing an organization for the free exchange of digital computer programs between various segments of the industry."

"We propose," he said, "that manufacturers and utilities join together to set up a clearing house for this purpose, perhaps administered by an organization such as EEI."

"To get this program started," Mr. Dillard added, "Westinghouse will contribute to such a clearing house in the immediate future, eight basic power system programs for use on IBM-704 computers. These will include our older programs, such as economic dispatch, as well as our recently developed short-circuit and transient stability programs."

In the interim period while such a clearing house is being set up, Westinghouse will make the programs available to utilities that have gained familiarity with their use at the company's East Pittsburgh facilities.

Mr. Dillard also stated that additional programs now being developed by Westinghouse would be made available periodically as they were completed and debugged.

Digital computers offer certain advantages for analyzing many power system problems. For example, those involving economic studies. Also many engineering problems must be solved repetitively using slightly different data. For these, the digital computer is particularly applicable. In addition, digital computer facilities are rapidly increasing in number and generally are more readily available for studies than analog computer facilities.

By and large, however, the ad-

CORRECTION: The following table was inadvertently omitted from the article in the February issue of ELECTRICAL SOUTH entitled, "Application of protective equipment on electrical distribution circuits," by F. P. Elam, apparatus engineer, Line Material Industries. The article dealt with the coordination of reclosers with sectionalizers and fuses. The table summarizes recloser rating information.

TABLE I
TABULATION OF RECLOSERS AVAILABLE TODAY AND THEIR SYMMETRICAL AMPERES INTERRUPTING CAPACITY, NOMINAL VOLTAGE RATING, BASIC INSULATION LEVEL, AND LOAD RATING

		Distribution Class	Power Class									
		95 kv BIL 2.4-14.4 kv	110 kv BIL 2.4 to 14.4 kv								150 kv BIL 2.4 to 23 kv	
			Class I		Class II				Class III			
Cont. Rating Amperes	Min. Trip Amp.	Single Phase Three Phase	Single Phase Three Phase		Single Phase		Three Phase		Three Phase		Single Phase	
		2.4 to 14.4 kv	4.8 kv	14.4 kv	4.8 kv	14.4 kv	4.8 kv	14.4 kv	4.8 kv	14.4 kv	14.4 kv	23 kv
5	10	125	200	200							200	125
10	20	250	400	400							400	250
15	30	375	600	600							600	375
25	50	625	1000	1000	1500	1500	1500	1500			1000	625
35	70	875	1400	1400	2100	2100	2100	2100			1400	875
50	100	1250	2000	2000	3000	3000	3000	3000			2000	1250
70	140		2800	2000	4200	4000	4200	4000			2500	1750
100	200		3000	2000	6000	4000	6000	4000	6000	6000	2500	1750
140	280				6000	4000	6000	4000	8400	8000		
160	320						6000	4000	9600	8000		
185	370						6000	4000	11,100	8000		
200	400				6000	4000						
225	450						6000	4000	12,000	8000		
280	560				6000	4000	6000	4000	12,000	8000		
400	800						6000	4000	12,000	8000		
400x	560								12,000	8000		
560	1120								12,000	8000		
560x	800								12,000	8000		

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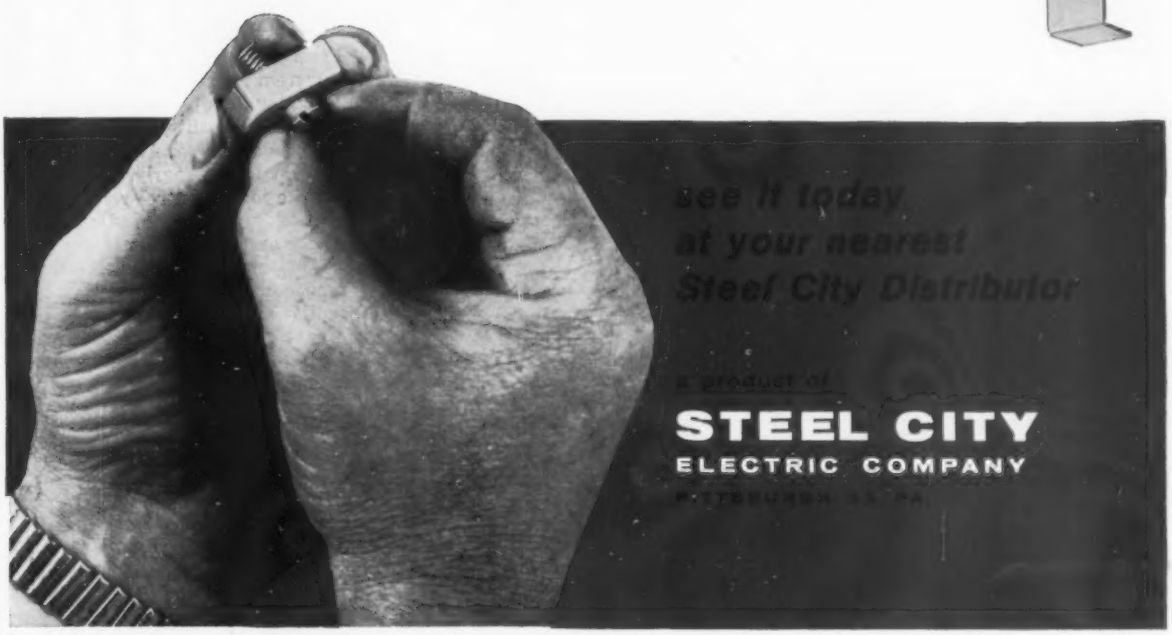


vantages of digital computers have not been fully exploited. One major obstacle to their extensive use has been the unavailability of programs.

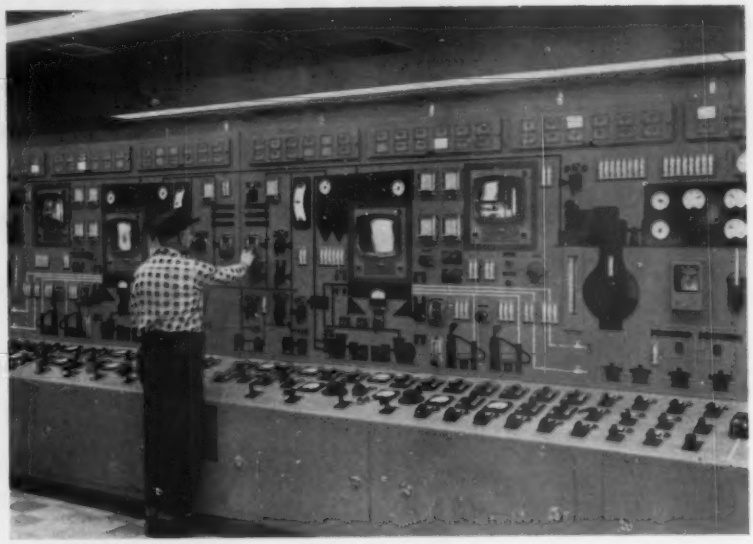
Commenting on this, E. L. Harder, director of the analytical department of Westinghouse, said, "To develop a typical basic program such as we are now offering to share with the industry without charge, costs between $20,000 and $50,000, depending on complexity of the program, and requires from one to three man-years to complete and debug. For each computer user to develop the same programs would obviously be impractical and would represent needless waste of money and time. Sharing our programs will result in advantages to all parties involved."

The eight programs that Westinghouse will first make available involve the following problem areas:

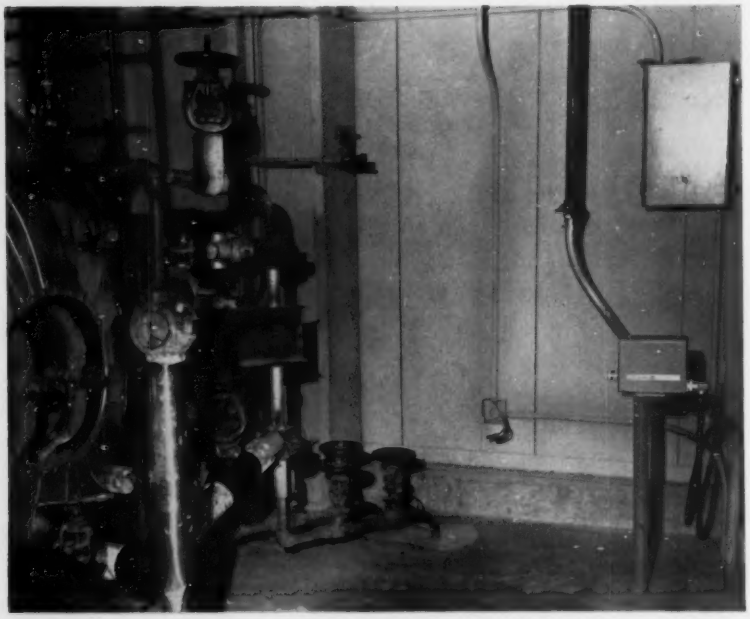
1. Self and mutual drop coefficients.
2. Loss formulas.
3. Economic dispatch.
4. I^2R losses.
5. Load flow.
6. Short circuit studies.
7. Transient stability.
8. Distribution feeder voltage control.

Release of the first eight programs and subsequent programs, or establishment of the proposed computer program clearing house, will not change Westinghouse's present service to customers who use the East Pittsburgh facilities.

Utility closed circuit TV applications



Operator at Kansas Power & Light Company's Tecumseh Power Station makes adjustments on main control panel. Four General Electric closed-circuit television monitors on the panel allow him to make adjustments on boilers at a remote location.



A closed-circuit television camera, mounted at right, monitors water gauge in a remote location at Kansas Power & Light Company's Tecumseh Power Station. The picture is fed to a monitor in a centrally located control room.

◆ A CLOSED-CIRCUIT television system that brings controls and visual checks into one central location is in operation at the Tecumseh Power Station of The Kansas Power and Light Company.

Furnished by General Electric, the system is used to monitor flame and water level gauges on three boilers of the utility company.

Both boilers and gauges are quite remote (nearly 300 feet) from the main control room. With the new system, periodic checks of these areas are no longer necessary. Operators in an air-conditioned control room can now look directly at the TV monitors and see that all burners are firing and that the proper water level is being maintained.

Cameras monitoring the boiler flames "look" through holes in the boilers. The camera's lenses are cooled by compressed air.

While in this instance the closed circuit TV is applied in a generating plant, the same principle will be applicable for other functions such as visual indication of remote meters, switches, etc.

These 4 steps show why SPANG brings you the best galvanized steel conduit!

THOROUGH CLEANING of the conduit before galvanizing removes all dirt, grease and scale, leaves a clean surface for the prime western zinc galvanized finish.

STEAM-WIPING of the conduit's exterior, as it comes from the kettle through an air ring, produces a smooth even finish that will stand up under severe bending.

SUPERHEATED STEAM blown through the conduit interior removes excess zinc inside, assures a smooth, uniform surface for easy wire pulling.

QUICK QUENCHING of the conduit in a sodium dichromate solution bonds the galvanized finish to the steel, adds extra service life, helps prevent white rust formation.

This is just part of the *quality-control* processing that each length of Spang HD Galvanized Conduit receives. Careful control from skelp through the inspection tables assures you of a *top-quality* conduit for *top-quality* installations. Try it on your next job! Your local Spang Distributor is at your service!

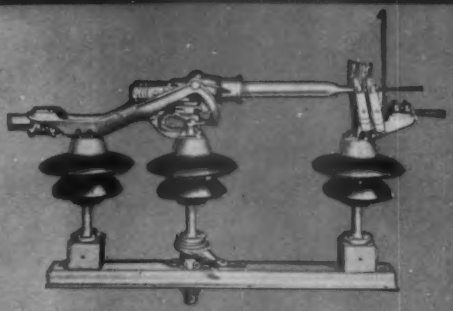
SPANG CONDUIT

THE NATIONAL SUPPLY COMPANY

Subsidiary of Armco Steel Corporation

TWO GATEWAY CENTER, PITTSBURGH, PA.

L-M Offers



VERTICAL BREAK and side break switching equipment (34.5 kv) has silver-to-silver contacts, few current-interchange points, and excellent lever advantage for breaking ice or corrosion. Bearings lubricated with silicone grease sealed in for life with silicone cord rings which are not affected by weathering or contamination. A complete line of L-M switches for vertical and horizontal mounting is available. Oil-filled load interrupter attachment for 34.5 kv vertical break switch also available.

THREE-PHASE 20/34.5 KV TRANSFORMER POLE. Three 10 kva Round-Wound transformers with 150 kv BIL are shown with L-M Type SS 27 kv arresters and 27 kv Type HDO cutouts. All this L-M equipment was specifically designed for this service.

LINE MATERIAL

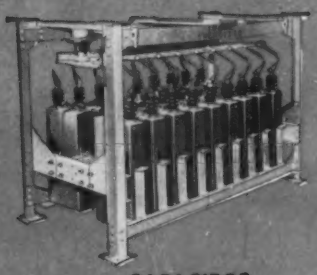
McGRAW-EDISON COMPANY

Distribution

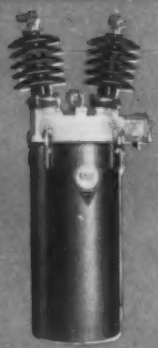
DISTRIBUTION TRANSFORMERS * POLE RECLOSERS AND OIL SWITCHES * FUSE CUTOUTS AND FUSE LINKS
CAPACITORS * REGULATORS * OUTDOOR LIGHTING * LINE CONSTRUCTION MATERIALS

the Most Complete Line of Equipment for 20/34.5 kv Distribution

L-M'S 27 KV TYPE SS distribution valve type arrester provides low-cost protection for 150 kv BIL apparatus.

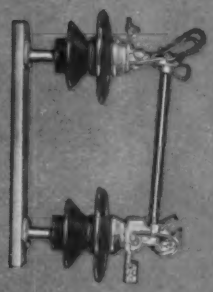


CAPACITOR EQUIPMENTS, blocks and banks to any size.



KYLE TYPE E RECLOSER, 23 kv, 150 kv BIL, in standard ratings, for single-phase extensions of the 20/34.5 system where the potential across the recloser will at no time exceed the maximum design voltage of 25.8 kv.

20 KV ROUND-WOUND® TRANSFORMER, specifically designed for this service, with 150 kv BIL, high overload capacity, low exciting current, and low losses.



TYPE HXO POWER FUSE (left) and Type HDO fuse cutout. The 27 kv, 100 ampere HDO has a rated interrupting capacity of 4000 amperes. The 38 kv, 200 ampere HXO has a rated interrupting capacity of 5000 amperes.

How 34.5 kv Distribution Cuts Costs... Here's Data on Methods, Materials

- Idaho Power Company pioneers 20/34.5 kv distribution, with ten years' experience.
- L-M pioneers, with research and development on apparatus, construction materials, and application for this economical distribution voltage.

by J. R. McDONALD, Field Engineer
Line Material Industries

Complete elimination of subtransmission, with fewer substations, higher feeder loading, and reduction of regulating equipment, resulting in lower cost per kva of installed capacity, appear to be among the major advantages afforded by 20/34.5 kv distribution, according to Idaho Power Company.

This progressive company now operates 275 pole line miles at this higher distribution voltage, and is expanding the system to serve additional farm customers. Idaho Power has found economical methods for conversion, and its experience is being generously offered to the industry. At the same time others, such as H. L. Hess of the Public Service Company of Indiana, Inc., have published the results of their studies.

L-M Provides Information, Apparatus

L-M has collected some of this data, and is offering a compilation, along with information on the apparatus and equipment L-M engineers have developed in working with Idaho Power Company and others.

Mail This Coupon For More Information

Ask your L-M Field Engineer for copies of papers L-M makes available on 20/34.5 kv distribution, or mail the coupon—and we will send them promptly—no obligation.

LINE MATERIAL Industries, Milwaukee 1, Wisconsin ES-39

Please send, free, copies of the following papers:

- ☐ 20/34.5 kv—An Economic Solution, by Don E. Haasch, Special Studies Engineer, Idaho Power Company
- ☐ 34.5 kv—A Possible Future Necessity, by H. L. Hess, Distribution Engineer, Public Service Company of Indiana, Inc.
- ☐ 20/34.5 kv Multi-grounded Wye Distribution System, by George W. Cooper, Line Material Industries
- ☐ Relative Merits of 20/34.5 kv Distribution by D. L. Andrews, Distribution Studies Engineer, Idaho Power Company
- ☐ The Long-Bus Substation, by D. L. Andrews, Distribution Studies Engineer, Idaho Power Company
- ☐ SEND ALL FIVE PAPERS PLEASE, IN FOLDER IMPRINTED WITH MY NAME

Name_____ Title_____

Company_____

Address_____

City_____ State_____

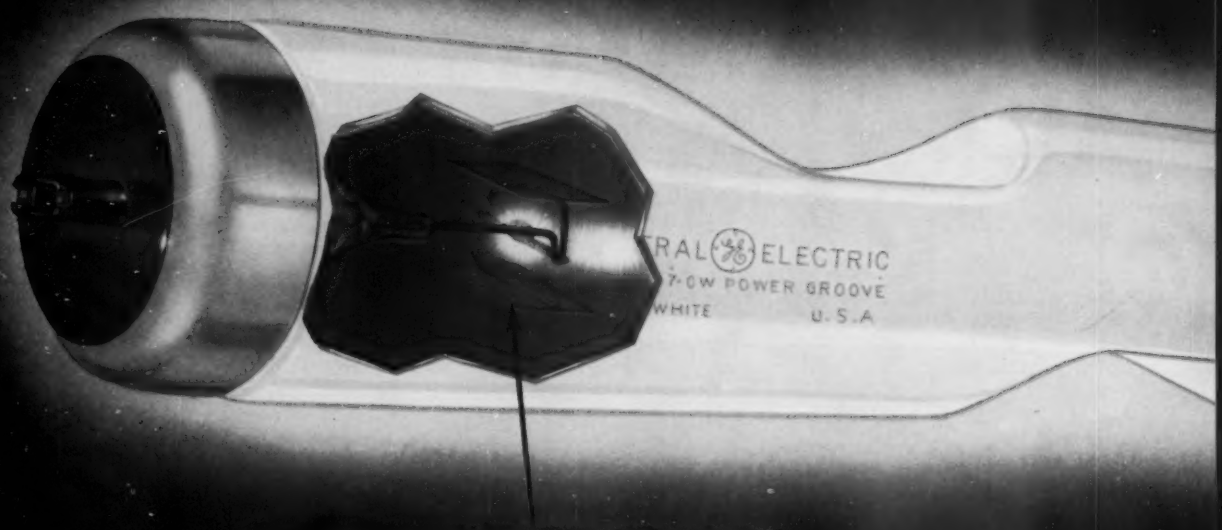
Industries Equipment

McGRAW EDISON

370

LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS
PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

NOW! THE MOST POWERFUL



Cathode shield improves anode action (reducing end loss) and collects tiny electrode particles that would otherwise land on glass wall, darkening end of tube. New G-E Power Groove stays brighter...end-to-end...longer!

NEW G-E POWER GROOVE LAMP...

- Gives most users lowest cost of fluorescent light...
- Saves them 10-30% on initial investment alone
- Stays cleaner, brighter longer—no darkened ends
- Will last about 3 years in single-shift service

The new Power Groove is the most recent advance in lighting from G. E., *your most consistent source for new and improved lamps* to give your customers more for all their lighting costs. If they are planning a new building, or remodeling an existing one, this dramatic improvement in lighting deserves first consideration.

LOWER CAPITAL INVESTMENT. That's the most exciting aspect of this new lamp. It costs no more than the original General Electric Power Groove, yet with all this light you can now plan on—*and deliver*—a higher level of lighting than was ever practical before. And the investment in lamps and distribution equipment is *even more* practical and economical!

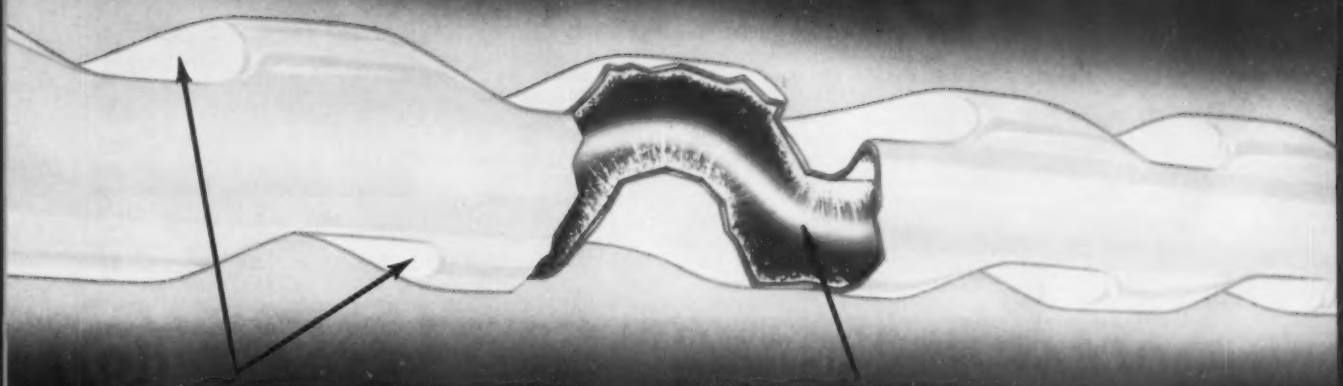
IMAGINE! A single 8-foot G-E Power Groove can deliver a startling 15,000 lumens—the highest light output obtainable from any fluorescent lamp available today. This gives users the lowest cost of fluorescent light for most new lighting systems, and establishes a new set of standards in overall lighting economy.

LIGHT OUTPUT STAYS HIGH. General Electric's efficient cathode shield reduces cathode wattage losses...and also collects the tiny electrode particles that would otherwise be deposited on the glass wall, darkening the lamp ends. General Electric Power Grooves now stay brighter . . . end-to-end . . . longer!

As your customers build or expand, increase your own profits by recommending the economy of the new G-E Power Groove Lamps for their general lighting. For more information, call your nearby G-E Large Lamp Distributor, or write: General Electric Co., Large Lamp Dept. C-913, Nela Park, Cleveland 12, Ohio.

FLUORESCENT YOU CAN BUY!

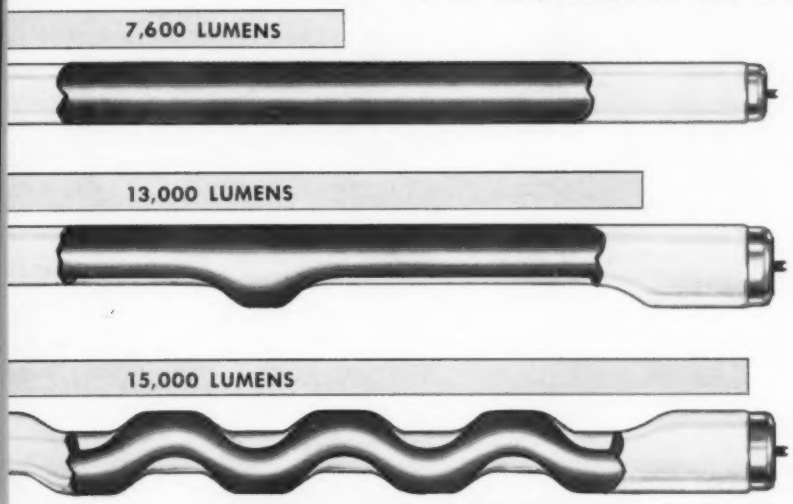
RATED LIGHT OUTPUT 15,000 LUMENS



Grooves or panels "squeeze" arc to increase light-producing power, give you same strength with thinner glass. They also aid light emission, enabling you to use more of total light given off by phosphor.

New configuration makes arc stream travel in a wavy path, makes greater electric power available for producing light. You get the arc equivalent of a 9-foot lamp!

THE SECRET'S IN THE SHAPE



REGULAR FLUORESCENT, shown here in the conventional round shape of the High Output Lamp, has a straight arc stream. As in the case of *any* fluorescent, this arc causes mercury vapor to radiate energy which excites phosphor on inside wall. This, in turn, gives off light.

ORIGINAL POWER GROOVE, developed by General Electric in 1956, has an interrupted groove along one side, continuous except for bridging at regular intervals to increase glass strength. Grooves or panels "squeeze" the arc to increase the light-producing power.

NEW POWER GROOVE has grooves on both sides to accomplish same "squeezing" effect. In addition, it makes arc travel in wavy path—a full foot longer in 8-foot tube! This gives you even *more* light-producing power. New shape also enables you to use more of the total light given off by the phosphor.

LONGER ARC STREAM, GREATER LIGHT-PRODUCING POWER GIVE YOU
A NEW LOW IN COST-OF-FLUORESCENT-LIGHT FOR MOST INSTALLATIONS

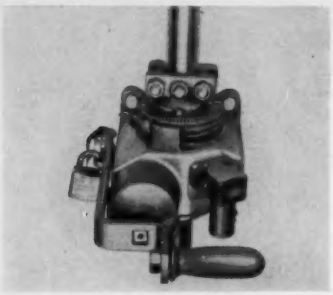
Progress Is Our Most Important Product

GENERAL ELECTRIC

Notes on new utility equipment

Gear box for power switches features easy mounting

A NEW GEAR BOX for torsional operating mechanisms of power switches has been designed by Line Material Industries, McGraw - Edison Co., Milwaukee 1, Wis. Applicable to vertical operating shafts of group-



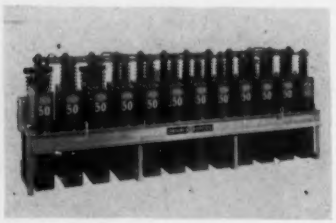
operated switches, the gear box has a shaft opening for 1½-inch IPS pipe. Available gear ratios are 20.5:1 and 40:1.

An important feature of the new gear box is the ease of mounting it at the most convenient height without cutting or drilling the operating shaft. The gear box is doubly keyed to the operating shaft with a bolted clamp and two self-piercing set screws. The removable handle stores compactly and locks the handle shaft in a fixed position. A "keeper" prevents accidental dislodgement of handle during switch operation.

Write U-301 on reply card, page 19.

Aluminum racks for pole-type capacitors

POLE-TYPE capacitor equipments featuring welded aluminum racks have been introduced by Sangamo Electric Co., Springfield, Ill. Weight



of these units has been reduced by as much as 11 per cent. These units permit easier installation and reduce weight per kvar on poles. Maintenance costs are greatly reduced because of the excellent corrosion resistant, high strength, and long service characteristics of the welded structural aluminum racks.

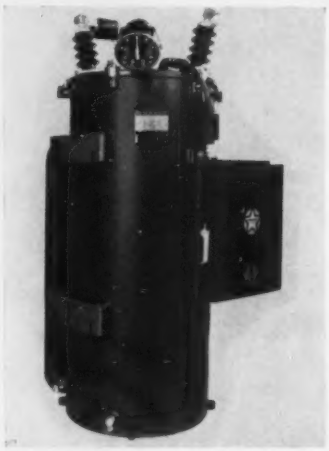
Equipments are available in in-line and multi-row assemblies in ratings from 150 to 600 kvar for use on distribution systems of 2.3 to 13.8 kv.

Write U-302 on reply card, page 19.

Voltage regulators feature integrating time delay

A COMPLETE LINE of single-phase step voltage regulators in 27 distribution ratings has been announced by Pennsylvania Transformer Division, McGraw-Edison Co., Canonburg, Pa. The new product line is said to offer many of the design and construction features of the company's "Pole Star" distribution transformer, after which the regulators have been named. Both station-type and pole-type units are available—the latter with hold-down lugs to facilitate platform installation.

The company reports that the new Pole Star Regulator is designed to provide maximum user-convenience



as well as efficient, automatic voltage regulation in 32 steps of ⅝ per cent each. Available sizes include voltages from 2500 through 14400 volts and current ratings from 15 through 668 amperes. A special "Mor-Amp" feature permits the regulating capacity to be increased to as much as 160 per cent of rated current, at reduced range.

Pole Star Regulators with current ratings above 320 amperes are equipped with a direct-drive tap changer that is said to utilize many principles of Pennsylvania's power-transformer load tap changers. Other operating features include a bridging reactor that prevents voltage interruptions and dips during tap changes, and an integrating time delay that prevents unnecessary tap changes.

Write U-303 on reply card, page 19.

New cable reel packing features faster unpacking

FASTER UNPACKING, less handling weight, and equal protection are promised by a new type of cable reel packing for reel sizes 48A

through 69B being introduced by Reynolds Metals Co., 6601 W. Broad St., Richmond, Va.

The new packing consists of a wrap of resilient padding and an overwrap of plywood inside the reel flanges. The padding is of a fibrous material one inch thick with an adherent backing of moisture resistant kraft paper. The plywood overwrap is laminated on both sides to heavy, weather-resistant kraft paper for a total thickness of one-fourth inch.

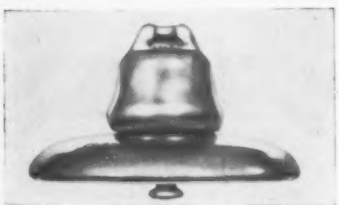
The entire wrapping is secured by metal strapping and can be removed in a fraction of the time needed for the heavy wooden lags previously used on the outside of the reels.

The new packing also offers a substantial handling weight saving over the conventional wooden lags which weigh up to 90 per cent as much as the reel itself. It also lessens the packing disposal problem for customers.

Write U-304 on reply card, page 19.

Suspension insulators feature gray glaze

THE A. B. CHANCE CO., Centralia, Mo., is now making 25,000-pound ball-and-socket suspension insula-

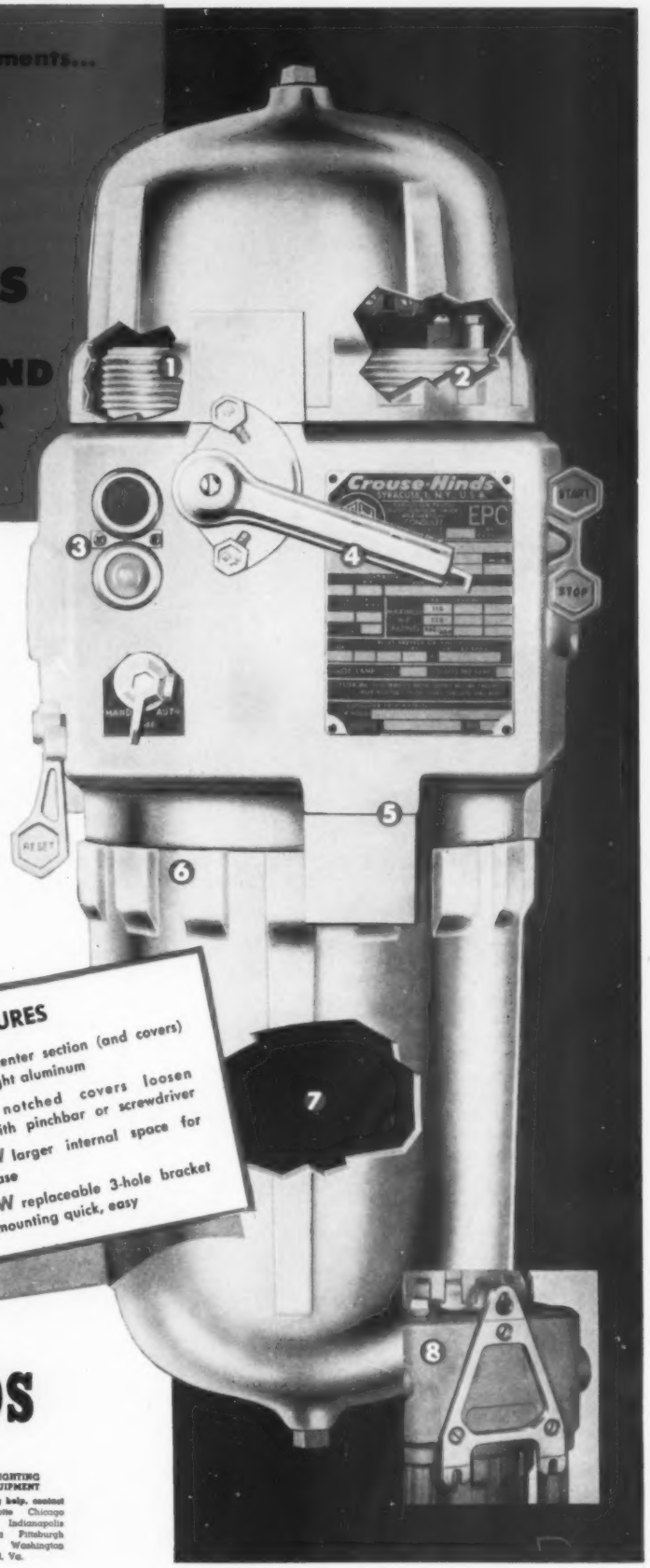


tors, with the new NEMA gray glaze.

This gray glaze distinguishes 25,000-pound insulators from standard, brown-colored, 15,000-pound insulators. This makes identification

Now with 8 important improvements...
at no increase in price

New EPC CROUSE-HINDS EXPLOSION-PROOF MOTOR STARTER AND CIRCUIT BREAKER



The latest refinement in a long-tested, proved and improved explosion-proof combination Motor Starter & Circuit Breaker, this new Crouse-Hinds Condulet® EPC-M59 brings you tomorrow's convenience, dependability and safety at yesterday's prices.

Designed to conform with the National Electrical Code requirements for Class I, Groups C and D; Class II, Groups E, F and G; and Class III, it provides for built-in breathers and drains . . . built-in push-button stations, selector switch and pilot lights . . . seven taper-tapped conduit entrances . . . starter below breaker for safe, easy maintenance . . . compact design to permit a greater number of controls in any given area.

Now available in 7" and 9" sizes for Sizes 1 and 2 starter combinations. For more detailed information consult your Crouse-Hinds distributor, or any of the offices listed below.

ALL THESE NEW FEATURES

1 **NEW** raintight joints for both top and bottom covers

2 **NEW** shoes and guidance slot for easier interior assembly mounting

3 **NEW** built-in pilot lights available where visual indication desired

4 **NEW** easier-to-lock breaker handle (takes up to 3 padlocks)

5 **NEW** center section (and covers) of lightweight aluminum

6 **NEW** notched covers loosen quickly with pinchbar or screwdriver

7 **NEW** larger internal space for wiring ease

8 **NEW** replaceable 3-hole bracket makes mounting quick, easy

CROUSE HINDS

MAIN OFFICE AND FACTORY: SYRACUSE, NEW YORK
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.
Crouse-Hinds Instrument Company, Inc., Silver Spring, Maryland

• CONDULET® ELECTRICAL EQUIPMENT (Explosion-Proof and Conventional) • FLOODLIGHTING
• TRAFFIC CONTROL SYSTEMS • AIRPORT LIGHTING and WEATHER MEASURING EQUIPMENT

These products are sold exclusively through electrical distributors. For application engineering help, contact one of the following offices: Atlanta Baton Rouge Birmingham Boston Buffalo Charlotte Chicago Cincinnati Cleveland Corpus Christi Dallas Denver Detroit Houston Indianapolis Kansas City Los Angeles Milwaukee New Orleans New York Omaha Philadelphia Pittsburgh Portland, Ore. St. Louis St. Paul Salt Lake City San Francisco Seattle Tulsa Washington
Resident Representatives: Albany Baltimore Reading, Pa. Richmond, Va.

certain and easy, eliminates any possibility of insulators of different strengths being coupled into the same string.

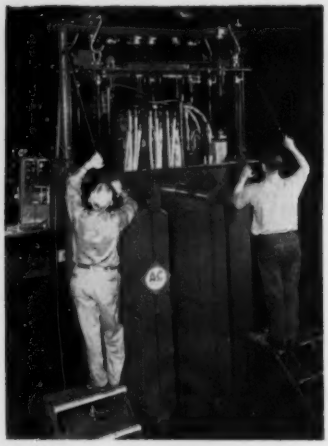
Ball-and-socket hardware facilitates installation and maintenance. This is particularly true when hot-line work is performed.

Chance gray-glaze insulators are made to the same rigid standards as brown-glaze insulators.

Write U-305 on reply card, page 19.

Untanking jack developed for three-phase regulators

AN "ON THE SPOT" jack unit has been developed for untanking three-phase regulators (type SFR) by Allis-Chalmers; Milwaukee 1, Wis. It



allows easy, complete inspection and maintenance of the tap changing mechanism.

The jack consists of two hydraulic units each rated 5000 pounds, which can be clamped to the SFR regulator tank braces. An "I" beam, attached to the two jacks, lifts the regulator as high as 36 inches for inspection or maintenance purposes.

Portable, the jack unit can easily be handled and operated by two men in any location where overhead clearances of the regulator installation is 24 inches or more.

Write U-306 on reply card, page 19.

New transmission tower design meets rigid tests

A STEEL transmission tower designed to compete economically against conventional wood H-Frame structures has been successfully tested by Anchor Metals, Inc., of Hurst, Texas and Fort Madison, Iowa.

The new structure, stressing light weight and beauty is comparable in cost-per-mile to the wood H-Frames supported lines, Anchor engineers reported. The towers, designed, fabricated and tested at Anchor Metals' Hurst plant, will carry 138 kv single circuit transmission lines.

The new type of tower is 68½ ft. high to the cross arm and 75½ ft. to the shield wire. Base dimensions are 24 ft. by 16 ft. Tower weight is only 4,162 lbs. without footings. The proper use of high elastic grade and standard A-7 steel was instrumental in design of the light weight tower.

During extensive testing performed recently, both transverse and longitudinal strength of the tower met maximum strains set forth in test specifications. Complete details are available from the manufacturer.

Write U-307 on reply card, page 19.

New guy protector economically priced

A NEW, economically priced guy protector, Stock No. 7628, has been added to their line by Hubbard and Co., 200 S. Michigan Ave., Chicago 4, Ill.

Only a simple spring clip at the top and a single bolt at the bottom are required for swift, sure installation.

The new tapered protector is made of 18 gauge galvanized steel. Edges are turned and rounded, eliminating the hazard of sharp corners being exposed to pedestrian contact. The product is said to have a high visibility factor.

The No. 7628 fits rods up to 1¼ inches inclusively and is available in eight foot lengths, No. 7627 is seven feet in length.

Write U-308 on reply card, page 19.

Jack pulls power poles in shorter time

UTILITY COMPANIES or their line contractors can pull power poles in one-sixth the former time with a powerful air motor jack recently re-

designed by the Joyce-Cridland Co., 2027 E. First St., Dayton 3, Ohio.

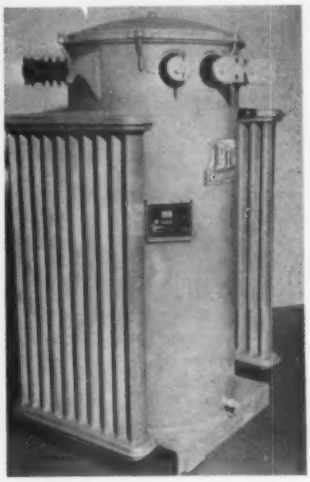
The Joyce Model 1720-RGLP jack, featuring a restyled toe lift and new heavier chain, brings its full 20-ton capacity to bear on utility poles, quickly pulling them clear regardless of pole size or soil condition. It is reported that time studies have shown the most difficult jobs which previously took up to 90 minutes can now be done in 15 with the Joyce unit.

Powered by an Ingersoll-Rand rotary air motor, the jack stands 28 inches high, weighs 240 lbs., and may be rolled into position on semi-pneumatic tires. Jack lowers only when motor is reversed, while top and bottom shut-offs provide extra safety.

Write U-309 on reply card, page 19.

Aluminum transformer needs no maintenance

NEW IN THE FIELD is the aluminum tank transformer announced by Precision Transformer Corp., 2218 W. Lake St., Chicago 12, Ill. This development gives the electrical and



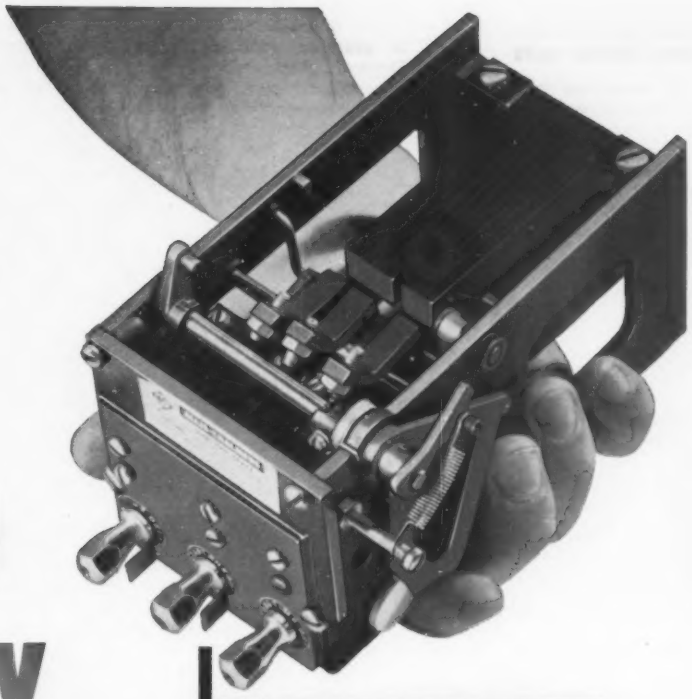
manufacturing industries a wide range of important benefits available only by housing distribution and power transformers in aluminum tanks.

Since aluminum needs no maintenance, it ends the costly labor and inconvenience of painting, chipping, and de-rusting conventional steel housings. Exposure to the elements results in oxidation and dulling of the aluminum, which builds up an added protective coating against further weathering.

Because aluminum saves two-thirds of the weight of comparable steel tanks, it provides many other savings and advantages, too: lower shipping costs, smaller installation crews, faster installations and handling at all times. Internal feed back and heating are eliminated, because of aluminum's improved electrical conductance. Aluminum's greater efficiency in the grounding of electrical distribution systems reduces the incidence of explosion by short circuit. By also eliminating sparking danger, aluminum provides a vital safety factor against fire.

Write U-310 on reply card, page 19.

ALLIS-CHALMERS
low voltage
switchgear



Here's

Proven Accuracy

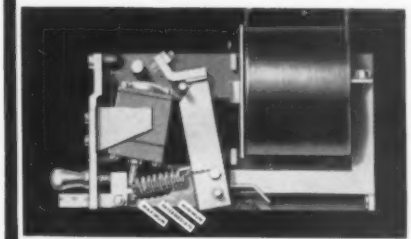
3 independent elements available in series trip device

This time-proven feature of Allis-Chalmers low voltage switchgear provides:

- **Accurate settings** — Adjusting knobs with calibration scales on front of trip device permit operator to adjust elements independently and set pickup for long time (80-160%), short time (500-1000%), and instantaneous (500-1500%).
- **Accurate action** — Silicone oil-filled, positive displacement time-delay device is completely calibrated and sealed under vacuum.
- **Accurate adjustment** — Minimum, maximum and intermediate time-delay band settings are field adjustable for each pickup value for fine selectivity.
- **Accurate indication** — Overcurrent trip flag to indicate phase which caused tripping of breaker is available.

Each trip element has its own armature and each armature acts directly on trip block. Accurate trip device is only one feature of Allis-Chalmers low voltage switchgear. For complete details, call an A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Operator inserting circuit breaker using positive-position pantograph. Note trip device accessibility, dead-front breaker, and drawout interlock.



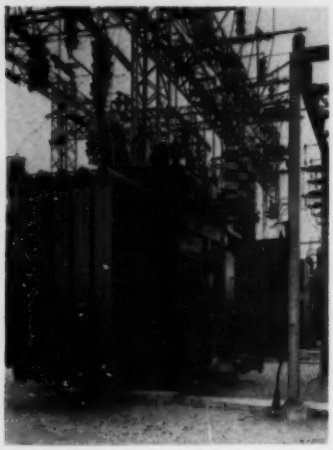
Cutaway shows arrangement of components in Allis-Chalmers direct-acting series trip device. Note calibration scale below adjusting knobs and time band setting on armature extension.

A-5553

ALLIS-CHALMERS

Inner-cooled transformers are smaller, lighter units

A NEW INNER-COOLED transformer, built by Westinghouse Electric Corporation's power transformer department in Sharon, Pa., is now in-



stalled and operating on the system of a New York utility company. It is reported by the manufacturer to be the first of its kind.

In the new inner-cooled design, the oil is circulated between the strands of parallel conductors that are at the same potential. Thus, oil ducts are eliminated between coils and windings. This allows the use of materials having higher insulation strength than oil where voltage stresses occur. In this manner, smaller, lighter, and higher capacity units can be built that have the same design margins as the conventional construction.

This 30-, 40-, 50-mva, OA/FOA/FOA, 115-kv transformer weighs 3.1 pounds per kva, compared to 3.5 pounds per kva for a similarly rated conventional unit.

Write U-311 on reply card, page 19.

Ventilating heater aids UG crew efficiency

THE MOPECO Model PE-G ventilating heater, manufactured by the Morrison-Pelsue Co., 2256 S. Delaware St., Denver, Colo., is becoming

increasing popular with underground crews throughout the public utility industry.

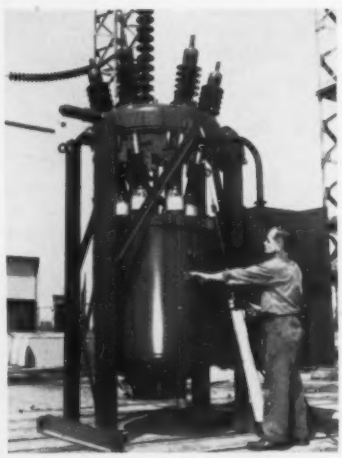
The 78-pound unit is portable and is equipped with a Briggs and Stratton engine which has been converted to propane operation. In warm weather when heat in manhole areas is not required, the heater may be shut off and the unit run as a ventilator, blowing from 300 to 800 cu. ft. per minute of fresh air into the work area. In colder weather when splicers and workmen need heat but must still work with bare hands, a switch on the unit furnishes almost immediate heat. All heated air passes through an exclusive MoPeCo stainless steel heat exchanger which produces from 10,000 to 45,000 BTU's per minute with a 90°F temperature rise.

An attached generator furnishes 300 watts of electric power to permit workmen to illuminate the manhole area with a light from a drop cord. The Model PE-G is placed near the manhole at street level. The 15-foot length of either 6-inch or 8-inch duct is placed so that the manhole end clears the manhole floor by one foot. This enables forced fresh air to get into all the corners and eliminates any danger of noxious gases. This greatly increases the safety factor for the worker, speeds personnel efficiency, and improves health conditions.

Write U-312 on reply card, page 19.

New breaker designed for five-cycle operation

A NEW single tank sub-transmission power circuit breaker with an operating time of 5 cycles has been introduced here by General Electric's



High Voltage Switchgear Department, Schenectady 5, N. Y.

The all-in-one tank breaker incorporates recent design improvements for sub-transmission applications and offers economies in installation, inspection, and maintenance.

Designed Type FKA, the single tank breaker is available in ratings from 15 to 46 kv with interrupting ratings of 500 to 1500 MVA, 1200 amperes.

Principal design advancements of the single tank breaker include its five-cycle operation and utilization of General Electric's new TBI (Transformer - Breaker Interchangeable) bushings. Operating at a full three cycles faster than the conventional three-tank sub-transmission breaker, the new breaker permits a reduction in maintenance expense through reduction in oil carbonization and contact deterioration.

Constructed of porcelain, the new TBI bushings are completely interchangeable between circuit breakers and transformers of similar voltage and ampere rating simply by switching top and bottom terminals.

Write U-313 on reply card, page 19.

New family of fuses introduced recently

A NEW FAMILY of power fuses, by Southern States Equipment Corp., Hampton, Ga., offers a full range of protection on power systems from 7.5 kv to 161 kv. There are three

types of the new fuses: the Type BP heavy duty power fuse with ratings from 7.5 kv to 69 kv—100 and 200 amperes; the Type MP extra-heavy duty fuse with ratings from 46 kv to 161 kv—100 and 200 amperes; and the Type HP extra-heavy duty fuse with ratings from 7.5 kv - 69 kv—300 and 400 amperes.

Exceptionally high interrupting capabilities are available in the new fuses. For example, at 69 kv, the extra-heavy duty fuses on a three-phase symmetrical basis, have interrupting capabilities of 2¼ million kva.

The new power fuses employ expendable caps and boric-acid "arc quenching" fuse element construction, which together with the basic design and new-type small-bore horn fibre lined expulsion tube, permit satisfactory clearance of both restricted and high fault currents.

Write U-314 on reply card, page 19.

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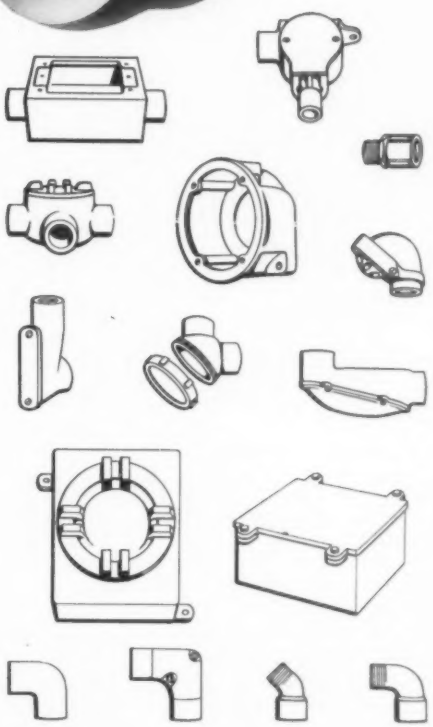

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CIRCUIT CONTROLS • PLUGS AND RECEPTACLES • LIGHTING FIXTURES • FLOODLIGHTS

Understanding the Code

By Walter R. Stone

This article should be especially helpful to the following readers:

Electrical Contractors ✔
Electric Utilities ✔
Electrical Wholesalers ✔
Electrical Inspectors ✔
Industrial Engineers ✔
Consulting Engineers ✔

◆ THIS MONTH we will complete our discussion of the remainder of Article 250 on grounding and the entire Article 280 on lightning arresters. This will also complete Chapter 2 of the Code.

By the term *grounding electrode* is meant that part of the ground return path which actually comes in contact with, and conducts fault currents to, the earth. Grounding electrodes recognized by the Code as suitable are (1) metal underground water piping systems, including metal well casings; (2) grounded metal frames of buildings; (3) a continuous metal underground gas piping system; (4) other metal underground piping systems, including buried tanks and associated equipment; (5) made electrodes, including rods, pipes, and plates; and (6) for rigidly restricted use, railway tracks.

Preferred ground system

Section 2581 of the Code *requires* that the underground water piping system be used for the grounding electrode if such a piping system is available. Most inspection authorities consider such a system "available" if it exists anywhere on the premises, including the outside of buildings on such premises. This is a requirement whether the piping system is an isolated local affair or a part of a city-wide network. If the buried portion of a water piping system is less than 10 feet in length, including the well casing, or if it is likely to be disconnected, it still must be used, but in addition one or more of the other recognized grounding electrodes must also be used in combination with and bonded to the water piping or well casing.

If the piping electrode and the supplimentary electrodes are *not* bonded together, there can, and very likely will, be a potential difference between them. This difference in potential is not only a possible shock hazard, but could result in an "objectionable passage of current over the grounding

Code test questions

1. Where the grounded circuit conductor is a neutral of a 3-wire d-c balancer set having proper overcurrent protection in the armature and equalizer leads, the grounding conductor shall be not smaller than the grounded neutral conductor. True or false?

2. Isolated noncurrent-carrying metal parts of outline lighting systems may be bonded together with a No. 14 wire provided that the No. 14 wire is protected from mechanical injury and provided that the proper size conductor is used to ground the entire group of isolated sections so bonded. True or false?

3. A grounding conductor shall not be run in the same metal raceway with other conductors of the system to which it is connected. True or false?

4. Grounding connections to noncurrent-carrying metal parts on the load side of the service may be made by solder type lugs to prevent interference with radio and television reception. True or false?

5. The secondary circuits of current and potential instrument transformers shall be grounded if the primary windings are connected to circuits of 300 volts or more to ground. True or false?

6. Instruments, meters, and relays on switchboards having no live parts on the front shall have the cases:
(a) grounded.
(b) ungrounded.
(c) adapted for consequent poles.
Which is correct? a? b? c?

7. Instruments, meters, and relays on switchboards having exposed live parts on the front shall have their cases:
(a) grounded.
(b) ungrounded.
(c) adapted for consequent poles.
Which is correct? a? b? c?

8. Instruments, meters, and relays having current-carrying parts of over 750 volts to ground on a switchboard without an electrostatic ground detector shall have their cases:
(a) grounded.
(b) ungrounded.
(c) adapted for consequent poles.
Which is correct? a? b? c?

9. On a switchboard having instruments, meters, and relays with current-carrying parts of over 750 volts to ground and having an electrostatic ground detector with internal segments connected to the case and grounded, the ground detector shall be:
(a) mounted on the lower section of the switchboard with no other device between it and the ground or floor.
(b) identified by a permanent red coloring or marking.
(c) isolated by elevation.
Which is correct? a? b? c?

10. If an isolating switch is used for disconnection of lightning protection equipment, the isolating switch shall:
(a) withstand in full open position a voltage test between live parts 10 per cent in excess of the maximum voltage test they will withstand to ground.
(b) be marked, "Do not open under load."
(c) be of the type that can be locked in the open position.
Which is correct? a? b? c?

Correct answers will be found at end of article on page 121.

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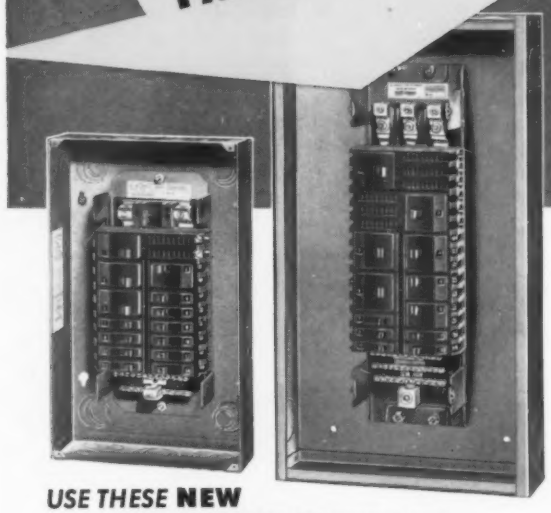

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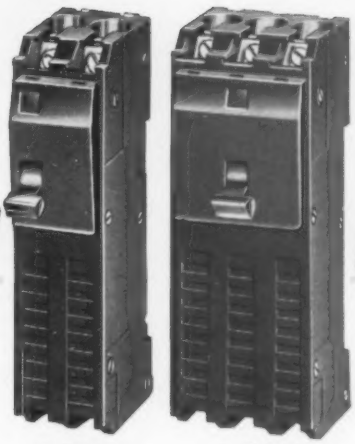

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THE "QO" FAMILY

QO 1-POLE 15-50 Amp | QO 2-POLE 15-70 Amp | QO 3-POLE 15-50 Amp | Q1 2-POLE 70-100 Amp | Q1 3-POLE 70-100 Amp

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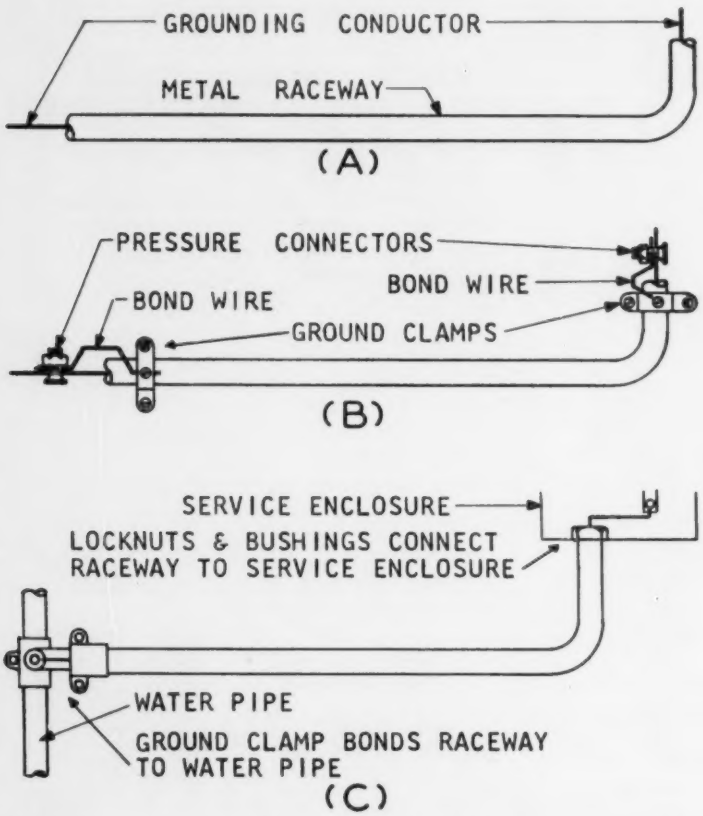
conductors" in violation of section 2521.

Very rarely will there be an interior wiring system in a building which does not have a metal underground water piping system or a metal well casing somewhere on the premises. But in the rare cases where this occurs, the Code requires that one or more of the grounding electrodes listed in (2), (3), or (4), above, be used. Then if these electrodes are also unavailable, one or more made electrodes must be used.

A noticeable amount of bickering has resulted from this sequence of choices when no water piping is available. Many inspectors dislike using the grounded frames of buildings for grounding electrodes because they are not satisfied in their own minds that the connections will remain intact. Therefore, many inspectors insist upon supplimentary grounding by means of made electrodes when building frames are used for grounding electrodes.

Gas piping systems make excellent electrodes, but here again there is a possibility of tampering and of disconnection. Many gas companies object to having a grounding connection made to the gas piping, and some of them remove all such connections when found to exist on their systems. A greater harmony in this respect is likely to materialize soon. Code-making authorities and utility company executives are working on this problem again, and the 1959 Code is likely to show an improvement as a result of their efforts.

Underground piping systems other than water or gas are not often available. A hot-air, oil-burning central heating system supplied by an underground oil pipe from a buried street-filled tank is one such system which could be available without water or gas being on the premises. Such a system would be a suitable electrode. But because of the scarcity of some types of electrodes and questionable characteristics of others, a great many inspectors permit, and some insist upon, made electrodes when no underground water piping or metal well casing is available, even when gas piping or grounded metal building frames are available.



(A) Metal raceway covering only part of the length of grounding conductor violates the Code which requires that it be continuous from point of attachment to cabinets or equipment to the grounding electrode. As shown here, the raceway forms a reactive "choke" which prevents the flow of the full fault current. (B) Bonding the raceway at each end to grounding conductor removes the choke effect but does not comply fully with section 2592-A. It is permitted by some inspectors. (C) This illustration shows raceway protecting grounding conductor to be continuous from enclosure to electrode and complies with Code.

"Made" grounding electrodes

Made electrodes may be either copper or galvanized steel rods; rigid galvanized steel, brass, bronze, or copper pipes; or brass, bronze, copper, or galvanized steel plates. (No odd lengths of rusty re-inforcement rods are permitted, even on temporary services.) Copper rods must be ½ inch, and galvanized rods ⅝ of an inch in diameter. Pipes must be ¾ of an inch in diameter. Plates must present at least 2 square feet of surface to the soil. Galvanized plates must be ¼ inch thick, and non-ferrous metal plates must be at least .06 inch thick.

Pipes are required to be driven 8 feet deep into the ground unless rock is encountered making this impossible, in which case the full 8 feet in length may be buried not less than 4 feet deep. In all cases, made electrodes should be below the permanent moisture level, and they are required to be not less than 6 feet apart when two or more are used.

Electrode resistance to earth

As a general rule, made electrodes are very poor grounding electrodes, especially in dry rocky soils. They should be checked frequently for resistance values. Section 2584 states, "Made electrodes shall, if practicable, have a resistance to ground not to exceed 25 ohms. If the resistance is not as low as 25 ohms, two or more electrodes connected in parallel shall be used."

A fine print note following this section is very important and informative. This note states, "Continuous metallic underground water or gas piping systems in general have a resistance to ground of less than 3 ohms. Metal frames of buildings and local

after-glow

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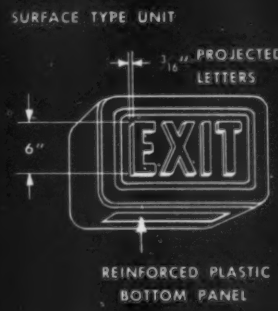

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metallic underground piping systems, metal well casings, and the like, have, in general, a resistance substantially below 25 ohms. It is recommended that in locations where it is necessary to use made electrodes for grounding interior wiring systems, additional grounds, such as connections to a system ground conductor be placed on the distribution circuit. It is also recommended that single electrode grounds when installed, and periodically afterwards, be tested for resistance."

The comments and recommendations in this fine print note were made by experts after extensive tests were made by them throughout the nation. These experts warn us that made electrodes are inferior and are not to be trusted without repeated testing. Yet inspectors are afraid of connections to gas piping and building frames for the reasons stated above. Consequently, it will be a great step forward in safety if the Code-making authorities can come to an understanding and have a definite agreement with gas company officials to permit untampered grounding to gas piping when water is not available.

Molested ground connections

The fear of tampering with ground connections to grounded building frames may be exaggerated in the minds of some inspectors. I have not had any experience with molested ground connections to building frames. It is quite possible, however, that isolated cases of molestation do exist. Fortunately, as stated above, underground water piping is available in the majority of cases.

Unfortunately, there still exist electricians who will install, and inspectors who will approve, made electrodes when water piping is available. This is done simply because the electrician objects to running a ground wire the necessary distance to reach water piping! Actually, there is less resistance in a #3/0 ground conductor run from the Texas Panhandle to the Gulf of Mexico than there is in the one-inch air gap between a driven ground rod and the dried-out cobble stones surrounding it such as I have seen in the same Texas Panhandle!

Grounded railway tracks are permitted by the Code to be used as the grounding electrode for interior wiring systems only when no other effective means is available and then only if the interior wiring system itself is derived from the railway circuit.

Lightning protection

Lightning rods and their grounding electrodes must be at least 6 feet from other made electrodes. All electrodes for lightning rods, communication and signal systems, and interior wiring should be bonded together.

The connection of the grounding conductor, when made to a gas piping system, is required by section 2612-b to be on the street side (supply side) of the gas meter. The connection to a water piping system is required by section 2612-a to be either on the street side of the water meter or else " . . . on a cold water pipe of adequate current-carrying capacity as near as practicable to the water service entrance to the building. . . "

This means that a building without a basement where the meter is in a curb-side hand hole, it is permissible to connect to the house side, or loadside, of the meter *provided that the connection is made at the nearest accessible point where the pipe enters the building.*

In addition, when the connection is made on the load side of the meter, " . . . the water piping system shall be made electrically continuous by bonding together all parts between the attachment and the street side of the water meter or the pipe entrance which are liable to become disconnected, as at meters, valves, and service unions."

Noncurrent-carrying equipment grounding conductors, as distinct from the system grounding conductor, " . . . may be grounded to a cold water pipe near the equipment." (This method of equipment grounding can be done only by special permission, however, as specified in section 2557-c for fixed equipment and in section 2559-e for portable equipment).

Ground clamps must be of the rigid type which will not stretch when tightened. They should be galvanized when attached to galvanized or iron piping, and copper, bronze, or brass when attached to copper, bronze, brass, or lead piping. They must be either placed where not subjected to mechanical injury or be provided with protective housing.

Grounding conductors size #8 are required to be protected by a metal raceway or metal armor. Size #6 is required to have similar protection unless " . . . rigidly stapled to the construction. . . " and if " . . . free from exposure to mechanical injury. . ." This metal enclosure " . . . shall be continuous from the point of

(Continued on page 120)

Questions on the Code

(Readers are invited to send in questions which they would like to see discussed in this department. Address them to Code Editor, ELECTRICAL SOUTH, 806 Peachtree St., NE, Atlanta 8, Ga.)

Applicability of EMT for electrical services

QUESTION: In my area, the power company will not connect a service installed in electrical metallic tubing. They told me to use Type SE cable or rigid threaded conduit. They said EMT was in violation of section 3482 which does not permit its use where subject to severe mechanical injury. I just moved here, but where I came from EMT is accepted. In fact, it is considered better than SE cable. What does the Code have on this?

ANSWER: Section 3482, which was cited by the utility company, states, "Electrical metallic tubing may be used for *both exposed and concealed* work. Electrical metallic tubing protected from corrosion *solely by enamel* shall not be used. Electrical metallic shall not be used (1) where during installation or afterward it will be subject to *severe* mechanical injury; (2) in *cinder* concrete or fill where subject to permanent moisture unless protected on all sides by a layer of *non-cinder* concrete at least 2 inches thick or unless the tubing is at least 18 inches under the fill; (3) in any hazardous locations except as otherwise provided in Article 500; (4) where exposed to *corrosive* vapor except as permitted in section 3483." (Italics added.)

This section does *not* say that electrical metallic tubing cannot be used for services. Section 2331 *does* say that electrical metallic tubing *can* be used for services. This section states, "Service conductors extending along the exterior, or entering buildings, may be installed as separate conductors, in cables

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approved for the purpose, or enclosed in rigid conduit, or, for circuits not exceeding 600 volts, in *electrical metallic tubing.*" (Italics added.) So EMT can be used for services.

As far as mechanical injury is concerned, section 2332 states, "Individual open conductors or cables other than approved service entrance cables, shall not be installed within 8 feet of the ground or where exposed to mechanical injury. *Service entrance cables,* if liable to contact with awnings, shutters, swinging signs, installed in exposed places in driveways, near coal shutes or *otherwise exposed to mechanical injury,* shall be of the protected type *or be protected* by conduit, *electrical metallic tubing* or other approved means." (Italics added.)

Clearly, then, the Code-making authorities consider EMT better protection than cable covering because (1) they specify EMT as suitable protection for cable; (2) they forbid cable where subject to *mechanical injury;* (3) they forbid EMT where subject only to *severe* mechanical injury.

We recommend cooperation with utility companies, of course. They are interested in promoting safety in all its phases, to say nothing of adequate wiring and Housepower. But in answer to your question, we can only say that EMT is permitted for use as service raceways.

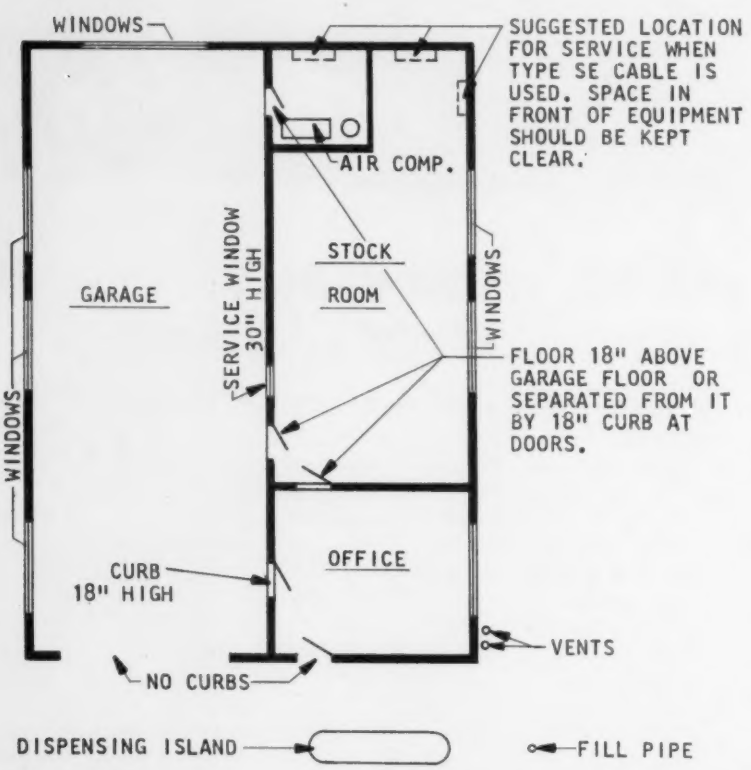
Use "watertight" threadless connectors on service runs of EMT to avoid the need of bonding around the connectors. Bond around locknuts to and including connections to the service enclosures.

Service cable for commercial garage

QUESTION: Would Type SE cable be permitted for service entrance conductors to a commercial garage?

ANSWER: This depends upon what part of the building the service conductors entered. Section 5105-e requires all wiring above the hazardous area in a commercial garage to be in metallic raceways or to be Type MI cable. Therefore, if the service entered the garage proper, Type SE cable would not be permitted unless the part on the inside of the area was enclosed in a metallic raceway.

However, section 5105 - b - 4 states, "Adjacent areas in which hazardous vapors are not likely to be released such as stock rooms, switchboard rooms and other similar locations, having floors elevated at least 18 inches above adjacent garage floor, or separated therefrom by tight curbs or partitions at least 18 inches high, shall not be classed as hazardous." In such areas as these, Type SE cable would be permitted.



Type SE cable could be used for service entrance conductors without being in metal raceway, in this commercial garage, if brought in to the building as shown in the air compressor room or stock room which are separated from garage proper by 18-inch curb or have their floors, elevated 18 inches above garage floor. SE cable could be used in the garage or office shown here only if in metal raceway, and then only if 20 feet or more from vents, fill pipes, or pump islands.

Code change sought on circuit breakers

◆ EXTENSIVE cooperative studies have been concluded by the National Electrical Manufacturers Association and the International Association of Electrical Inspectors with agreement to sponsor jointly a proposed revision to the 1959 National Electrical Code concerning the interchangeability of circuit breakers.

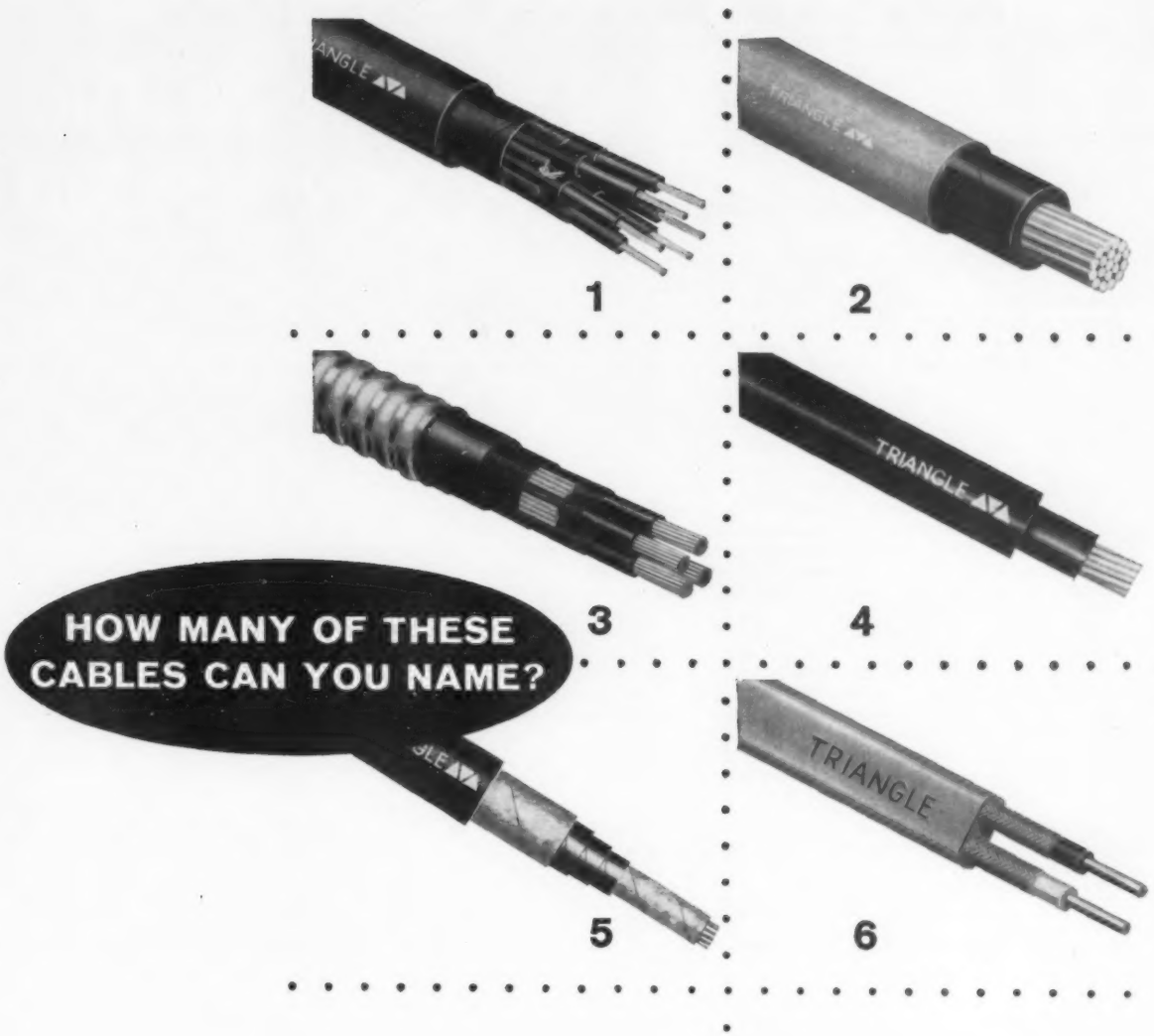
As announced by the Molded Case Breaker Section of NEMA, the proposed revision will require that circuit breakers be non-interchangeable in equipments rated within the range of 0-250 volts, a-c, and not more than 100 amperes. Such breakers are used for lighting and appliance branch circuits and residential and other occupancies.

Exceptions to the revision are circuit breakers which operate under conditions of maintenance and supervision which assure that overcurrent protective devices and branch circuit wiring will be maintained at proper rating.

The ampere range of breakers included in the proposed revision follow: 0-20; 21-50, and 51-100.

In referring to the agreement, members of the NEMA Section said:

"The substitution of a circuit breaker with one containing a higher rating has long been objected to by electrical inspectors. The proposed Code change will eliminate this practice and provide industry with a uniform set of requirements instead of a series of conflicting ordinances on this equipment."



These six are only a few of the many types in the Triangle line of Power, Lighting and Control Cables. How many can you name without peeking at the bottom of the page?

You've probably worked with or specified every one of these types many times – more and more contractors and engineers are doing that these days. They've worked with Triangle Conduit and Building Wire products for years. And they've now become convinced that Triangle can turn out power cables to the same high quality standards. They know Triangle products "must be right"—they must be dependable long-time performers.

Why don't you find out more about these and other cables in the broad Triangle line. Write for complete literature which is available to answer your specific inquiry.

Buy Right—Buy From Your Distributor

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

"It MUST Be Right!"

1 Control Cable 2 Varnished Cambric Lead Covered Power Cable 3 Interlocked Armor Power Cable 4 RR Cable 5 Asbestos Varnished Cambric Power Cable 6 UF Cable

New, revised estimating tables continued in this issue

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

REWORK JOBS

PANEL'S "SWITCH & FUSE" DISTRIBUTION
3 AND 4 WIRE - SURFACE MOUNTED

PANEL SIZE	HOURS EA.	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
4	4.1	5.13	6.15	7.18	8.20	9.23	10.25	11.28	12.30	13.33	14.35	15.38
6	5.8	7.25	8.70	10.25	11.60	13.05	14.50	15.95	17.40	18.85	20.30	21.75
8	7.5	9.38	11.25	13.13	15.00	16.88	18.75	20.63	22.50	24.38	26.25	28.13
10	9.2	11.50	13.80	16.10	18.40	20.70	23.00	25.30	27.60	29.90	32.20	34.50
12	11.3	14.13	16.95	19.78	22.60	25.43	28.25	31.08	33.90	36.73	39.55	42.38
14	13.0	16.25	19.50	22.75	26.00	29.25	32.50	33.75	39.00	42.25	45.50	48.75
16	14.9	18.63	22.35	26.08	29.80	33.53	37.25	40.98	44.70	48.43	52.15	55.88
18	16.7	20.88	25.05	29.23	33.40	37.58	41.75	45.93	50.10	54.28	58.45	62.63
20	18.7	23.38	28.05	32.73	37.40	42.08	46.75	51.43	56.10	60.78	65.45	70.13
22	20.7	25.88	31.05	36.23	41.40	46.58	51.75	56.93	62.10	67.28	72.45	77.63
24	22.4	28.00	33.60	39.20	44.80	50.40	56.00	61.60	67.20	72.80	78.40	84.00
26	24.6	30.75	36.90	43.05	49.20	55.35	61.50	67.65	73.80	79.95	86.10	92.25
28	26.5	33.13	39.75	46.38	53.00	59.63	66.25	72.88	79.50	86.13	92.75	99.38
30	28.6	35.75	42.90	50.05	57.20	64.35	71.50	78.65	85.80	92.95	100.10	107.25
32	30.7	38.38	46.05	53.73	61.40	69.08	76.75	84.43	92.10	99.78	107.45	115.13
34	32.8	41.00	49.20	57.40	65.60	73.80	82.00	90.20	98.40	106.60	114.80	123.00
36	35.0	43.75	52.50	61.25	70.00	78.75	87.50	96.25	105.00	113.75	122.50	131.25
38	37.3	46.63	55.95	65.28	74.60	83.93	93.25	102.58	111.90	121.23	130.55	139.88
40	39.2	49.00	58.80	68.60	78.40	88.20	98.00	107.80	117.60	127.40	137.20	147.00
42	41.3	51.63	61.95	72.28	82.60	92.93	103.25	113.58	123.90	134.23	144.55	154.88

E-101-B

LABOR: INCLUDES DISSASSEMBLY OF PANEL, DRILLING ANCHOR HOLES, SETTING ANCHOR'S OR SCREWS, INSTALLING CABINET, MAKING ALL BRANCH CONNECTIONS, BALANCING LOAD AND REASSEMBLY OF PARTS AND CABINET.

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THE SIZZLING NEW

Spiralite

PROMOTION BY **MOE LIGHT**

Sculptured polished brass beauties with exciting perforated patterns and smart black disk trim. Designed and priced to make sales history for you!

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Reaching 7,950,000 Readers!

FREE MERCHANDISING AIDS!

- FREE mats for local newspaper use.
- FREE color poster—big blow-up of national ad.
- FREE "Spiralite" fixture tags for extra sales.

SEND NOW FOR NEW 1959 CATALOG. 52 PAGES IN FULL COLOR (including "Spiralite")

THOMAS INDUSTRIES INC.
LIGHTING FIXTURE DIVISION
Executive Office: 410 S. Third St., Louisville 2, Ky.

SPECIAL SALE PRICES!

M-1579 PULL-DOWN
Shade 18" wide. Adjusts 25" to 58"
Regular dealer price $23.31
Dealer SALE Price 17.97
YOU SAVE $5.34
Special retail sale price $29.95

M-1577 CLUSTER
Diameter each cone 5"; over-all diameter 18". Each cone adjustable to 46".
Regular dealer price $19.98
Dealer SALE Price 14.97
YOU SAVE $5.01
Special retail sale price $24.95

M-1400 POLE LIGHT
Adjusts from 7'9" to 9'. Comes with 9' cord and plug. Each cone 9" long; swivels up, down, sideways. 3-way switch.
Regular dealer price $19.98
Dealer SALE Price 14.97
YOU SAVE $5.01
Special retail sale price $24.95

M-1572 PENDANT
Diameter 5". Adjusts to 72" over-all.
Regular dealer price $8.64
Dealer SALE Price 5.97
YOU SAVE $2.67
Special retail price $9.95

M-1575 CLOSE-TO-CEILING
Sculptured polished brass with white ceramic-decorated glass. Diameter 11⅜"; depth 5".
Regular dealer price $6.64
Dealer SALE Price $4.77
YOU SAVE $1.87
Special retail sale price $7.95

Introductory sale prices end May 31, 1959

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410 So. Third St., Louisville 2, Ky., Dept. ES-3

☐ Rush new MOE Light Catalog and Lighting Guide, plus full details of new "Spiralite" promotion.

☐ Have my distributor salesman call on me.

Name_____
Company_____
Address_____
City_____ Zone_____ State_____
My distributor is_____

OVERHEAD SERVICE RACKS - WITH INSULATORS
WOOD MOUNTED

NO LINE CONDR.	CONDR. SPACING	HOURS EACH	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
			$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
1		.37	.463	.56	.65	.740	.83	.93	1.02	1.11	1.20	1.30	1.39
2	4"	.53	.66	.80	.93	1.06	1.19	1.33	1.46	1.59	1.72	1.86	1.99
2	6"	.58	.73	.87	1.02	1.16	1.31	1.45	1.60	1.74	1.89	2.07	2.21
2	8"	.69	.86	1.04	1.21	1.38	1.55	1.73	1.90	2.07	2.24	2.42	2.59
2	12"	.80	1.00	1.20	1.40	1.60	1.80	2.00	2.20	2.40	2.60	2.80	3.00
3	4"	.84	1.05	1.26	1.47	1.68	1.89	2.10	2.31	2.52	2.73	2.94	3.15
3	6"	.90	1.13	1.35	1.58	1.80	2.03	2.25	2.48	2.70	2.93	3.15	3.38
3	8"	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75
4	4"	1.1	1.38	1.65	1.93	2.20	2.48	2.75	3.03	3.30	3.58	3.85	4.13
4	6"	1.11	1.39	1.67	1.94	2.22	2.50	2.78	3.05	3.33	3.61	3.89	4.16
4	8"	1.22	1.53	1.83	2.14	2.44	2.75	3.05	3.36	3.66	3.97	4.27	4.58
			CONCRETE MOUNTED										
1		.64	.80	.96	1.12	1.28	1.44	1.60	1.76	1.92	2.08	2.24	2.40
2	4"	1.01	1.26	1.52	1.77	2.02	2.27	2.53	2.78	3.03	3.28	3.54	3.79
2	6"	1.01	1.26	1.52	1.77	2.02	2.27	2.53	2.78	3.03	3.28	3.54	3.79
2	8"	1.1	1.38	1.65	1.93	2.20	2.48	2.75	3.03	3.30	3.58	3.85	4.13
2	12"	1.2	1.50	1.80	2.10	2.40	2.70	3.00	3.30	3.60	3.90	4.20	4.50
3	4"	1.4	1.75	2.10	2.45	2.80	3.15	3.50	3.85	4.20	4.55	4.90	5.25
3	6"	1.54	1.93	2.31	2.70	3.08	3.47	3.85	4.24	4.62	5.01	5.39	5.78
3	8"	1.6	2.00	2.40	2.80	3.20	3.60	4.00	4.40	4.80	5.20	5.60	6.00
4	4"	1.8	2.25	2.70	3.15	3.60	4.05	4.50	4.95	5.40	5.85	6.30	6.75
4	6"	1.80	2.25	2.70	3.15	3.60	4.05	4.50	4.95	5.40	5.85	6.30	6.75
4	8"	1.87	2.34	2.81	3.27	3.74	4.21	4.68	5.14	5.61	6.08	6.55	7.01

E-102-B

LABOR: INCLUDES INSTALLATION AND SECURING.

3-59

SERVICE HEADS
THINWALL

COND. SIZE	HOURS EACH	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
1/2"	.22	.28	.33	.39	.44	.50	.55	.61	.66	.72	.77	.83
3/4"	.22	.28	.33	.39	.44	.50	.55	.61	.66	.72	.77	.83
1"	.32	.40	.48	.56	.64	.72	.80	.88	.96	1.04	1.12	1.20
1 1/4"	.32	.40	.48	.56	.64	.72	.80	.88	.96	1.04	1.12	1.20
1 1/2"	.43	.54	.65	.75	.86	.97	1.08	1.18	1.29	1.40	1.51	1.61
2"	.54	.68	.81	.95	1.08	1.22	1.35	1.49	1.62	1.76	1.89	2.03
		RIGID										
1/2"	.22	.28	.33	.39	.44	.50	.55	.61	.66	.72	.77	.83
3/4"	.32	.40	.48	.56	.64	.72	.80	.88	.96	1.04	1.12	1.20
1"	.43	.54	.65	.75	.86	.97	1.08	1.18	1.29	1.40	1.51	1.61
1 1/4"	.54	.68	.81	.95	1.08	1.22	1.35	1.49	1.62	1.76	1.89	2.03
1 1/2"	.54	.68	.81	.95	1.08	1.22	1.35	1.49	1.62	1.76	1.89	2.03
2"	.65	.81	.98	1.14	1.30	1.46	1.63	1.79	1.95	2.11	2.28	2.44
2 1/2"	.76	.95	1.14	1.33	1.52	1.71	1.90	2.09	2.28	2.47	2.66	2.85
3"	.86	1.08	1.29	1.51	1.72	1.94	2.15	2.37	2.58	2.80	3.01	3.23
4"	.97	1.21	1.46	1.70	1.94	2.18	2.43	2.67	2.91	3.15	3.40	3.64
5"	1.2	1.50	1.80	2.10	2.40	2.70	3.00	3.30	3.60	3.90	4.20	4.50
6"	1.4	1.75	2.10	2.45	2.80	3.15	3.50	3.85	4.20	4.55	4.90	5.25

E 104 B

LABOR: INCLUDES DISASSEMBLY, ASSEMBLY TO CONDUIT OR CABLE, SECURING AND REASSEMBLY.

3-59

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(GUARANTEED BY SYLVANIA)

A new plan to protect your lighting investment: Sylvania fluorescents must give you more light at lower cost than any other brand... or cost you nothing!

Now, Sylvania fluorescent lamps *have got to outperform all other brands* on the basis of uniformity of performance, uniformity of appearance, maintained brightness, and life. They *must* give you more light, at lower cost, than any other brand!

Because if they don't, they cost you nothing.

Under a unique new policy, every large, regular user of Sylvania fluorescent lamps can have his lighting investment insured by Sylvania—at no cost to himself! If Sylvania's fluorescents do not live up to these claims, Sylvania refunds full purchase price.

How can we afford this kind of protection?

Answer: We know our product. We have studied it, worked with it for years to put it in a clear position of quality leadership. We can't lose.

And what better time to offer this new insurance than 1959—the year in which Sylvania engineers have swept *light-years* ahead of competition in fluorescent lamp efficiencies. For Sylvania fluorescents now give over 75 lumens per watt in the 75-watt, 8-foot lamp size . . . over 70 lumens per watt in the 40-watt, 4-foot size.

Ask your Sylvania representative or supplier to see a copy of the new Sylvania Light Insurance policy. And insist you get a policy with your next purchase. *If you prefer, write to us direct.*

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LIGHTING • TELEVISION • RADIO • ELECTRONICS • PHOTOGRAPHY • ATOMIC ENERGY • CHEMISTRY-METALLURGY

News of the industry

edited for Southern readers

Heat pumps featured at Florida exposition

YEAR 'ROUND, all-electric air conditioning has stolen the spotlight at the 13th Annual Florida Electrical Exposition at the Florida State Fair, Tampa, sponsored by Tampa Electric Co., area electric utility firm.

Visitors to the State Fair have learned that they need have no fears of the weather. Whether outside temperatures are near freezing, as they were during Fair time last year, or normally warm, such as is the case this year, they can find a haven in the Electrical Exposition Building.

The Electrical Building is comfort-conditioned by nine Typhoon Prop-R-Temp Heat Pumps, a total of 105 tons of year 'round, all-electric air conditioning.

In addition to the nine Heat Pumps located to cool or heat the building, there are eight individual displays of Heat Pump models.

Also displayed were room air conditioning units, air conditioning equipment, insulation materials, and radiant electric heating equipment.

NECA SCHOLARSHIP ESTABLISHED AT VMI—J. M. Richardson, governor of the Virginia Chapter, National Electrical Contractors Association, presents a check for $15,000 to Colonel John S. Jamison, head of the Electrical Engineering Department at Virginia Military Institute, to establish a scholarship fund for electrical engineering students. This is the first fund of its type created by NECA in the nation. Looking on are J. D. Richardson (left), son of Mr. Richardson and NECA alternate governor, and Major General William H. Milton, VMI superintendent.

Electric supply house opens new showrooms

EIGHT HUNDRED fixtures are displayed in the new showrooms of the Southeastern Electric Supply Co., 1611 Coward St., Chattanooga, Tenn., and more than 600 of them can be lighted at the same time.

When the company decided to expand and move to a new and larger building, E. J. (Ed) Rogers, president went to many cities all over the South looking for ideas for his showrooms. As the result of careful planning Southeastern has one of the most up-to-date display rooms in the South.

There is a main display room and a series of smaller rooms which are open at the front providing the customer an unobstructed view of all the showrooms as he passes through the main room. All kitchen fixtures are together in one room, the bathroom fixtures in an adjoining room, and outside fixtures in still another separate room. The showroom ceilings are different heights, 10 feet, 8½ feet, and 8 feet, for display purposes.

The main room is 66 feet long and 45 feet deep. There is a separate room for fluorescent fixtures which is 20 by 35 feet. The showroom is made of birch paneling, eliminating maintenance and adding much to the decor.

Realizing that parking facilities are important today, the company has two blacktop lots with space for 60 cars.

(Left) A portion of the new showroom of the Southeastern Electric Supply Company, Chattanooga. There are 800 fixtures in the modern display arrangement, which includes separate showrooms for kitchen, bathroom, outdoor, and other type fixtures. (Right) E. J. (Ed) Rogers, president, and Alex D. Erwin, Jr., sales manager of the company, are shown in the outdoor fixture display room.

Southeastern Electric Supply Co. was founded by Mr. Rogers and L. B. Austin, vice-president, in January 1946. The company started as a lighting fixture specialty business but has developed into a full fixture wholesale supply house.

L. Morris Landers Co. opens new warehouse

L. MORRIS LANDERS Co., manufacturers' agents, Atlanta, Ga., recently opened a new office and warehouse. The new and enlarged facilities are designed to serve their customers with larger and more complete stocks than before.

The new location gives them rail siding and truck docks located in the heart of industrial Atlanta with complete facilities to receive and ship with the least possible delay.

A special feature of the firm's new office facilities is the Bell system TWX for direct communication with the factories and customers who are also equipped to use this service.

The territory served from the Atlanta warehouse includes Georgia, Florida, Alabama, Tennessee, and Mississippi. Salesmen are located at strategic points throughout the area.

Arkansas utility man named to India mission

AN ARKANSAS businessman and area development leader has been selected by the Bureau of Foreign Commerce as a member of the U. S. Trade Mission to Calcutta, India.

William M. (Bill) Shepherd, a vice-president of Arkansas Power & Light Co., Little Rock, will be one of six American industrial representatives who will tour the principal cities in the Calcutta area and will consult and advise with local business men and government officials, individually and in groups, on American methods of doing business, application of U. S. production techniques, and development of specific trade and investment opportunities.

After completing their tour, the mission will occupy offices at the Trade Information Center of the U. S. Exhibit in Calcutta to which additional Indian businessmen will be invited.

Shepherd began his AP&L career thirty years ago as secretary to the company's president. Before being elected vice-president of sales in 1949, he served as director of safety, claims and personnel, rural development director, and industrial development director.

He has served as national president of the U. S. Junior Chamber of Commerce in 1942-1943; and the following year was selected as One of The Ten Outstanding Young Men in America.

J. M. Oliver retires from Georgia Power

JAMES M. OLIVER, executive vice-president and general manager and a director of the Georgia Power Co., has retired from active service under provisions of the company's pension plan. John W. Lastinger, formerly

J. W. Lastinger

J. F. Pennington

vice-president in charge of public relations and advertising, has been named executive vice-president and a director. John F. Pennington, formerly vice-president in charge of engineering and operations, was elected vice-president and general manager.

Mr. Oliver was born in Dadeville, Ala., and attended Alabama Polytechnic Institute, graduating in 1915 with the degree of bachelor of science in electrical engineering. Shortly after, he joined the Alabama Power Company, where he was employed in the construction and operating departments. In 1916 he was named operating engineer.

He joined the Georgia Power Company on August 1, 1927, as operating manager, and in 1944 was elected vice-president in charge of operations. He was advanced to vice-president and general manager in 1951. On January 1, 1957, he was elected executive vice-president and general manager, and on the same date was elected a company director. The veteran utility official has been a director of Southern Services, Inc., since 1953.

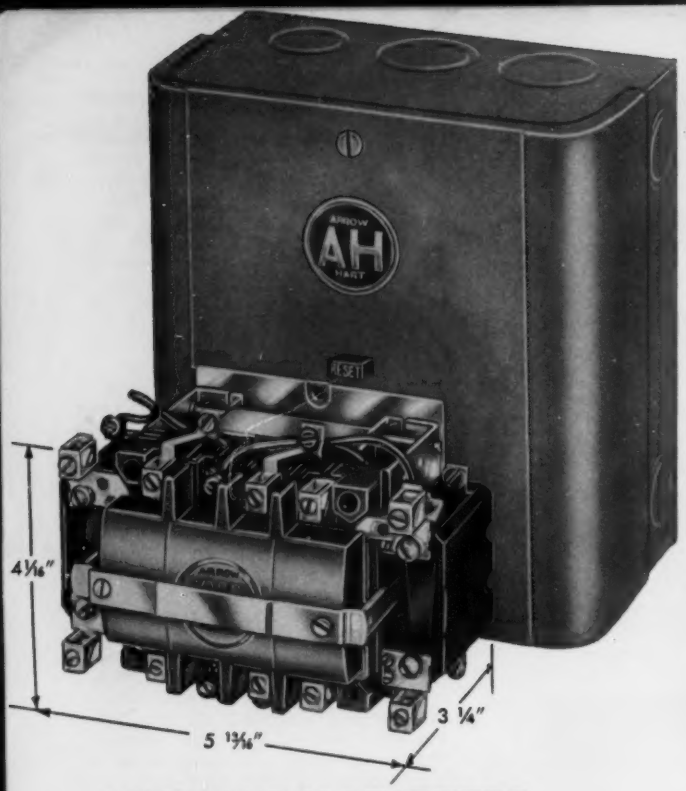
Mr. Lastinger is a native of Valdosta, Ga., and was graduated from Valdosta elementary and high schools and attended Emory University. He joined the Georgia Power and Light Company in 1926 and four years later was promoted to the general manager. In 1932 he was named division manager and in 1945 was promoted to vice-president and division manager.

In 1950 he became president of Georgia Power and Light; and when the properties of that firm were sold in March, 1957, to the Georgia Power Co., he was elected vice-president and Valdosta division manager of Georgia Power. In October, 1957, he was named vice-president in charge of public relations and advertising.

A native of Hartwell, Ga., Mr. Pennington has been vice-president in charge of engineering and operations since July, 1957.

He joined the company in 1918,

SOUTHEASTERN METERMEN'S ASSOCIATION—An executive meeting of the Southeastern Metermen's Association was held in St. Petersburg, Fla., recently. Plans were made for the thirty-fourth short course and conference on electric meters which will be held April 6 through 10, 1959, at the University of Florida, Gainesville, Fla., sponsored by the Department of Electric Engineering.



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HERE'S HOW:

- **NEW WIDE VOLTAGE RANGE COILS . . .** available for Sizes 0, 1 and 2. Now 1 coil replaces 3 conventional coils, *saves you money.* STANDARD COIL VOLTAGES: 110-120, 208-230, 440-480, 550-600 VAC, at 60 cycles. New molded epoxy resin construction gives far better protection against shock, vibration, humidity, oil, moisture, fungus and other severe environmental conditions.
- **NEW WRAP-AROUND ENCLOSURES . . .** for Size 1 give maximum accessibility. Make starters easier to install, wire, inspect and maintain.
- **STRAIGHT-THRU FRONT WIRING . . .** and easy front accessibility of contacts makes your job faster, easier.
- **50% SAVINGS IN SPACE AND WEIGHT . . .** make "RA" Starters easy to locate and install. More space for wiring and for other components.
- **A COMPLETE LINE . . .** of "RA" Starters, including Sizes 0 through 5, provides the right controls for all your jobs.

Write today for your free copy of Catalog 14: Arrow-Hart & Hegeman Electric Co., Dept. ES, 103 Hawthorn St., Hartford 6, Conn.

Have you seen the new Arrow-Hart 100 Amp Add-On Entrance Equipment?

ARROW AH HART

Quality since 1890

MOTOR CONTROLS • ENCLOSED SWITCHES
APPLIANCE SWITCHES • WIRING DEVICES

ARROW AH HART

serving in various capacities in construction and maintenance activities. In 1937 he was named superintendent in charge of wholesale operations. In 1945 he was appointed general superintendent, transmission and distribution.

Mr. Pennington was named operating manager of the company in 1950, and three years later was elected vice-president in charge of operations. In August, 1957, he was elected vice-president in charge of engineering and operations.

Anderson establishes new product division

THE CREATION of a Special Products Division at Anderson Electric Corp., Birmingham, Ala., has been announced by C. E. Bitzer, sales vice-president.

The function of this division will be to pioneer the commercial development of new and varied electrical products for use by industry, electrical equipment manufacturers, and government agencies. The Special Products Division will replace and assume the duties of the company's former Manufacturers Equipment Division. The Division Product Manager will be W. N. Davidson.

Mr. Davidson is a native of Montgomery, Alabama, and attended Alabama Polytechnic Institute and the University of Cincinnati, where he majored in electrical engineering.

The organizational shift, Mr. Bitzer said, is designed to stimulate and help assure Anderson's long range growth through increased product diversification.

H. M. Horton retires from General Electric

AFTER 33 YEARS service in Atlanta with the Lamp Division of General Electric Co., Harold M. Horton, district engineer, is retiring to become

H. M. Horton

associated with Ruff and Cannon, manufacturers' agents.

Following his graduation from Tufts College in 1924 with an Electrical Engineering degree and grad-

uate work at Columbia University, Mr. Horton joined General Electric's Edison Lamp Works in Harrison, N. J., in 1925. That same year, he transferred to the Southeast Lamp Sales District in Atlanta.

From the era of 60-watt bulbs on the end of drop cords, Mr. Horton has been instrumental in bringing the lighting industry to the South and has seen it grow into the many-faceted industry that it is today.

In addition to his job responsibilities, he became the training nucleus of the industry, conducting numerous lighting schools in the Southeast throughout his 33 years with the company.

Having been continually associated with the lighting industry, Mr. Horton is a charter member of the Illuminating Engineering Society and the Georgia Engineering Society. He served as editor of the "Georgia Engineer," publication for the latter organization.

Petersen announces new vice-president

THE PETERSEN Engineering Co., Inc., of Santa Clara, Calif., announces the appointment of J. T. Isbell as vice-president.

Mr. Isbell recently retired from the A. B. Chance Company as assistant to the president, after 32 years of service with that organization.

In his new capacity with Petersen Engineering Co., Mr. Isbell will concern himself mainly with customer relations.

G-E announces improved 100-watt bulb

GENERAL ELECTRIC has announced two major improvements in the household light bulb, the 100-watt size.

They are: (1) a 6 per cent "dividend in light," worth more than half the cost of the bulb; and (2) reduction of the bulb size to the more convenient one of present 60 and 75-watt household lamps.

Both improvements were made possible by a development in which the tungsten filament position is changed from crosswise to lengthwise along the bulb axis.

First production of the new brighter, smaller light bulbs is in glare-reducing "soft white" inside-coated bulbs. It will be on counters nationwide by spring, 1959, at no increase in price. Use of the improved construction in popular inside-frosted household bulbs will follow, according to Marketing Manager Ralph H. Humbert of G.E.'s Large Lamp Department.

Humbert noted that the new G-E lamps will come in the familiar teardrop bulb shape, which has proved most sturdy and easy to handle, ship, and use for many years.

ARROW AH HART

YOU ASKED for these

Heavy-Duty Grounding Receptacles!

No. 5714 Cord Set
for use with 50A, 250V receptacles

No. 5754 Receptacle
4-wire, 50A, 250V with U-shaped slot

Developed at your demand – these 30 and 50 ampere, 250 volt grounding receptacles are of sturdy bakelite construction. For heavy-duty applications primarily, these receptacles are U-slot grounded for protection of equipment and operator. *Tough, safe* and of dependable H & H Specification grade *quality*, they are right for –

PLANT USE . . . with electric portable tools and welding and maintenance equipment

OFFICE USE . . . with all types of office machines

HOME USE . . . with ranges, dryers, freezers and other heavy-duty appliances.

Brass or Stainless Steel plates are available.

No. 5737 Receptacle
4-wire, 30A 250V with U-shaped slot and galvanized cover. (Both No. 5737 and its 50A counterpart, No. 5738 fit 4-11/16" square box not less than 2-1/8" deep.) Listed as standard by Underwriters' Laboratories.

No. 5715 Cord Set
Both No. 5714 and No. 5715 4-wire rubber cord sets for use with 30A and 50A 250V receptacles. Available in 3', 4' and 6' lengths.

Write for more detailed information on these and other Grounding Receptacles in the complete Arrow-Hart line

Dept. ES — The Arrow-Hart & Hegeman Electric Co. 103 Hawthorn St., Hartford 6, Conn.

ARROW AH HART

Quality since 1890

MOTOR CONTROLS · ENCLOSED SWITCHES
APPLIANCE SWITCHES · WIRING DEVICES

NOW YOU CAN HAVE BOTH

FAMOUS ALL-BRITE HI-OUTPUT INDUSTRIAL

PLUS

A NEW 30° MATCHING LOUVER for GUIDED LIGHTING . . .

ALL-BRITE
ALL NEW
LOUVER Power Groove

DESIGNED SPECIFICALLY FOR ALL THESE GREAT LAMPS:
VHO, SHO, Power Groove

BUILT LIKE A HEAVY-DUTY TRUCK:
STRONG, SOLID, SAFE

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LIGHT OF AMERICAN COMMERCE

ALL-BRITE FLUORESCENT FIXTURES, INC.
352 SHAW ROAD, SOUTH SAN FRANCISCO, CALIF.

PLANTS ALSO IN LOS ANGELES AND SEATTLE.
IN CANADA: ALL-BRITE LIGHTING (B.C.). VANCOUVER. B.C.
REPRESENTATIVES THRUOUT THE UNITED STATES AND CANADA

Kenner elected president of Ansonia

IT HAS BEEN ANNOUNCED that Frederick Kenner has been elected president of the Ansonia Wire & Cable Co., Ashton, R. I., succeeding J. S. Chafee. Mr. Kenner took office recently.

During his business career, Mr. Kenner has been closely associated with the wire and cable industry. In 1937 he founded the R. I. Insulated Wire Company and became its president.

Brief news notes of manufacturers

H. K. PORTER Co., Inc., is continuing its expansion in the electrical equipment industry with the announcement today by T. M. Evans, chairman, of the acquisition of the business of National Electric Products Corp., Ambridge, Pa.

The current expansion step was accomplished through the issuance of $15 million worth of the company's 5½ per cent cumulative sinking fund preference stock. Porter authorized an issue of $25 million of this voting preference stock.

Roughly $7 million of this stock was utilized to complete the merger of Thermoid Company into H. K. Porter Co., Inc.

* * *

ROME CABLE Corporation and Aluminum Company of America have announced plans to affiliate.

Frank L. Magee, president of Alcoa and A. D. Ross Fraser, president of Rome Cable, announced that agreement had been reached on a plan by which Alcoa will acquire all the properties of Rome Cable for 355,226 shares of Alcoa common stock. This will permit distribution to Rome shareholders of 3 shares of Alcoa common stock on each 5 shares of Rome common stock. The agreement is contingent upon the approval of Rome shareholders who will meet on March 25th, 1959. If approved, it will take effect immediately.

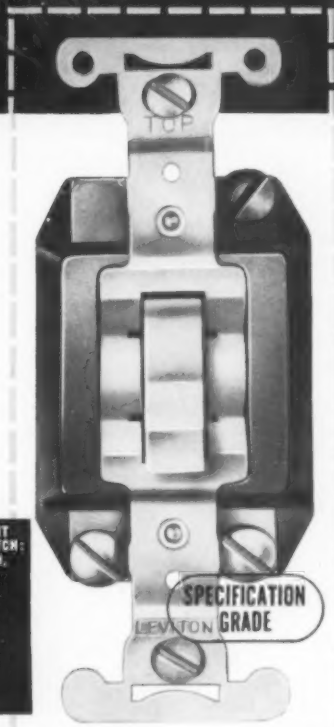
* * *

ARTOLIER Corporation has moved into new and larger quarters on Lanza Ave., Garfield, N. J. This move will permit the expansion of present production, service facilities and the expansion of Artolier's line itself.

* * *

FORMATION of an integrated sales organization responsible for the products of three units of Daystrom, Inc., has been announced by Thomas Allinson, president of each of these units, known as the Daystrom-Weston Division of Daystrom, Inc.

The Daystrom-Weston Sales Division will be under the direction of



No more fumbling in the dark . . . no more dirty walls from "switch-groping." Instead, a tiny, built-into-the-handle neon lamp that always remains bright, lasts a lifetime, and costs but a few cents a year to operate! This switch is sturdy, easy-to-install, with no moving parts to wear out, no springs to snap. Ideal wherever silence is essential . . . now popularly priced for every installation.

And . . . it's just one of the many fine, economical devices made available to everyone through the superior skills and complete resources of LEVITON!

For the complete story, write today on your letterhead.

All silent switches listed by U. L. and C. S. A.

LEVITON SILENT MERCURY SWITCH: Fully enclosed, rated 10A.-125V.T., 5A.-250V. Ivory toggle, with illumination. Single Pole No. 5361 or Three Way No. 5563

Available boxed or carded. Specify "K" when ordering on card.

Your best jobs are done with . . .

LEVITON MANUFACTURING CO., INC., BROOKLYN 22, N.Y.

Chicago • Los Angeles • Leviton (Canada) Limited, Montreal

LEVITON

For your wire needs, contact our subsidiary AMERICAN INSULATED WIRE CORPORATION

Wilbert H. Steinkamp, vice-president marketing, who will control sales, advertising, promotion, application engineering, market research, and sales training for the Daystrom-Weston divisions with common market interests.

* * *

FEDERAL PACIFIC Electric Co. has completed negotiations for the acquisition of Economy Fuse and Manufacturing Co. of Chicago. This transaction, completed recently, involved the exchange of 97,750 shares of Federal Pacific common stock for all the shares of Economy Fuse and its subsidiaries, according to announcements by T. M. Cole, Federal Pacific president, and J. S. Messer, president of Economy.

New Orleans association elects 1959 officers

W. H. BRAMBLETT was elected president of the Electrical Association of New Orleans at a recent meeting. Other officers elected were Arthur Wachter, executive vice-president; Amos Brewer, treasurer; and Sherwood Cuyler, secretary.

Elected to the executive committee were Wes P. Massey, Wayne D. Baker, C. G. Glueck, Allen W. Betz, Emile B. Barris, E. A. Rodrigue, E. N. Avegno, John J. Aertker, William O'Regan, and Frank Prattini, ex-officio.

After presenting a report covering association activities during his tenure in office, Prattini, retiring president, was welcomed into the President's Club.

New officers of the Electrical Association of New Orleans are from left to right Arthur Wachter, executive vice-president; Amos Brewer, treasurer; W. H. Bramblett, president; and Sherwood Cuyler, secretary.

General Electric dissolves two divisions

A REALIGNMENT of 12 General Electric departments has been effected in organizational shifts designed to increase corporate efficiency, President Robert Paxton has announced. No physical relocation of manufacturing facilities is presently contemplated, he said.

Mr. Paxton said the moves include dissolution of two existing product divisions, and reassignment of their departments to other segments of the company. The divisions dissolved are the Measurements and Industrial Products Division with headquarters in West Lynn, Mass., and the Construction Materials Division with headquarters in Bridgeport, Conn.

Rodale names president and two vice-presidents

AT A RECENT reorganizational meeting of the board of directors of Rodale Manufacturing Co., Inc., Emmaus, Pa. manufacturer of electrical wiring devices, Elmer A. Barto was elected president. J. I. Rodale, former president, becomes chairman of the board. At the same time, two new vice-presidencies were created. Jacob Schmier, plant superintendent since 1930, becomes vice-president in charge of production, and Jack Kushner, national sales manager since 1954, assumes the title of vice-president in charge of sales.

Barto joined the Rodale firm in 1930 when Rodale moved its plant and executive offices from New York to Emmaus. He held the position of assistant purchasing agent from 1932 to 1934, when he became purchasing agent. In 1951, he was elected a vice-president of the firm.

Manufacturers appoint new representatives

COLUMBIA CABLE & Electric Corp., Brooklyn, N. Y., announces the appointment of Arling D. Smith Com-

HOPE TO RAISE RECORD SUM—Members of the golf committee for the famed Triangle Round Robin founded by John E. McAuliffe, president of Triangle Conduit and Cable Co., met in New York's Toots Shor's restaurant recently to formulate plans for what may be the greatest charity event in golf history—the tournament at Canoe Brook Country Club in Summit, N. J., June 3 to 7. Left to right are Sammy Kaye, chairman of the Pro-Celebrity Committee of the tournament; John E. McAuliffe, Jr.; Ted Bishop, 1946 U. S. Amateur Champion; Mrs. Kay Farrell, National Golf Chairman of the American Women's Voluntary Service which will benefit completely; Willie Turnesa, former British and American Amateur Champion; and the director of the tournament, Carl S. Menger, executive vice-president of Triangle.

pany as their representative in the southern part of Texas. The Arling D. Smith Company, which is located at 1901 Commerce St., Houston, Texas, maintains a warehouse in Houston, from which it will supply the territory.

* * *

THE APPOINTMENT of Jay G. Gates as a sales representative for The Fisher-Pierce Co. of South Braintree, Mass. has been recently announced.

Gates' territory includes southern Ohio and the entire state of Kentucky. His office is located at 2430 Central Parkway in Cincinnati.

* * *

CRESCENT Insulated Wire & Cable Co., Inc., of Trenton, N. J., announces the appointment of Berry-Elsberry Co., 47 Alabama St., S.W., Atlanta, Ga., as their representative in Georgia, Alabama, Eastern Tennessee, and Western Florida, and Mississippi.

Left to right, Ed Elsberry and Jim Berry, who will represent Crescent wire and cable.

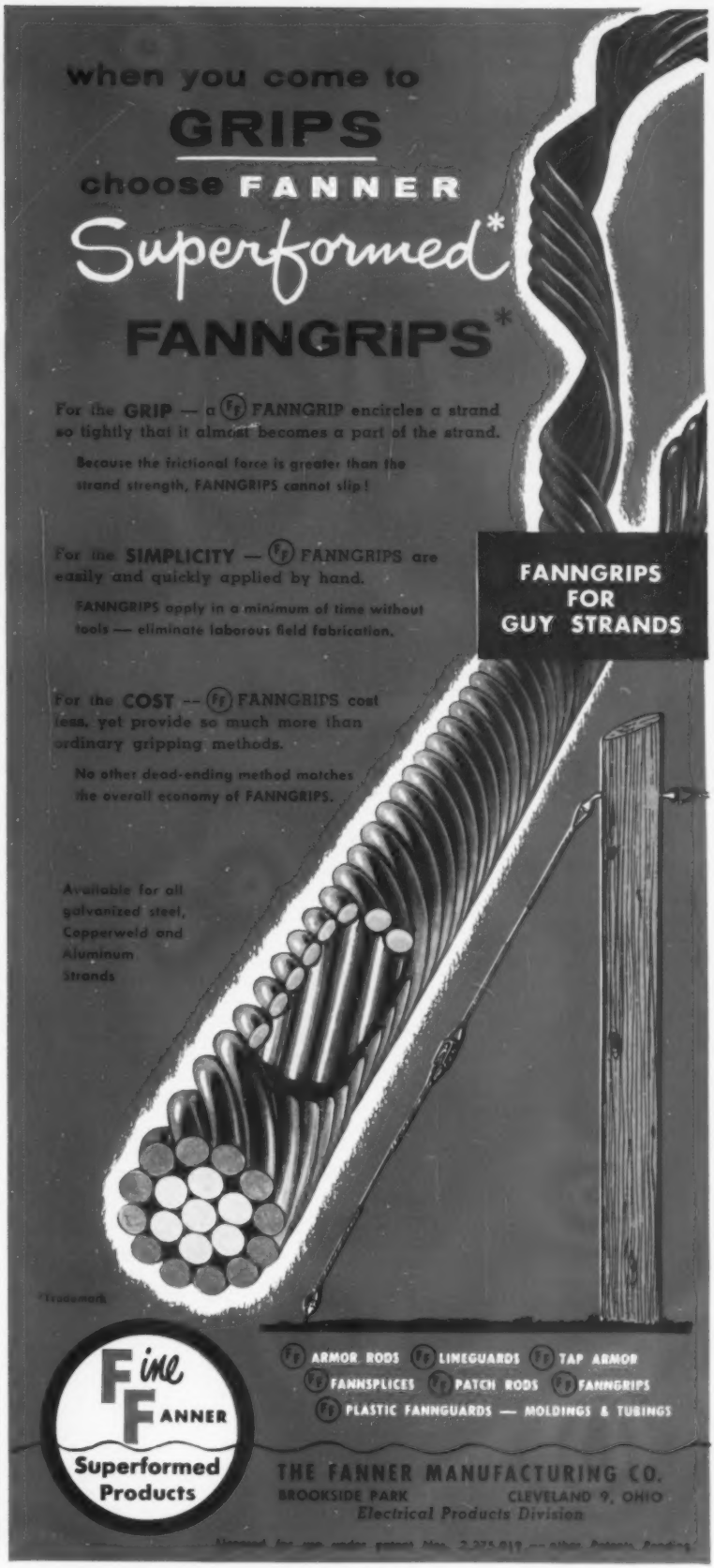
Robert W. Fishburne Company has been appointed sales representative for the entire South Carolina territory. This company has been representing Crescent in Virginia and North Carolina for the past fourteen years.

* * *

ALLAN P. FORREST, 459 LaBelle Rd., Grosse Point Farms 36, Mich., has been appointed to represent EJS Lighting Corporation in Michigan, Western Ohio, and Kentucky, according to an announcement by Irving P. Siegle, general sales manager of EJS.

* * *

HERBERT L. VINTON has been named Florida district manager for Hunter Division of Robbins & Myers, Inc. Mr. Vinton, who has been R&M Hunter's district manager in Philadelphia since 1954, replaces Herman H. Crout, who died late in 1958. Mr. Crout served as the company's dis-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GRIPS
choose FANNER
Superformed*
FANNGRIPS*
For the GRIP — a FF FANNGRIP encircles a strand so tightly that it almost becomes a part of the strand.
Because the frictional force is greater than the strand strength, FANNGRIPS cannot slip!
For the SIMPLICITY — FF FANNGRIPS are easily and quickly applied by hand.
FANNGRIPS apply in a minimum of time without tools — eliminate laborous field fabrication.
For the COST -- FF FANNGRIPS cost less, yet provide so much more than ordinary gripping methods.
No other dead-ending method matches the overall economy of FANNGRIPS.
Available for all galvanized steel, Copperweld and Aluminum Strands
FANNGRIPS FOR GUY STRANDS
*Trademark
Fine Fanner
Superformed Products
FF ARMOR RODS FF LINEGUARDS FF TAP ARMOR
FF FANNSPLICES FF PATCH RODS FF FANNGRIPS
FF PLASTIC FANNGUARDS — MOLDINGS & TUBINGS
THE FANNER MANUFACTURING CO.
BROOKSIDE PARK CLEVELAND 9, OHIO
Electrical Products Division

trict manager at Orlando for 12 years prior to his death.

* * *

GREGORY-SALISBURY & Co., Inc., has been named manufacturers' representative in Louisiana, Arkansas, and parts of Mississippi and Tennessee for Anderson Electric Corporation of Birmingham, Ala.

Territory for the new representative is the same as that formerly serviced by Anderson's own representative, John B. Rogers. Mr. Rogers recently returned to Anderson's Birmingham headquarters to become distribution division product manager.

* * *

THE EDWIN F. GUTH Company has appointed Fred MacRae, 6503 Tyne Ave., Cincinnati, Ohio, their new

Fred MacRae

lighting representative for southern Ohio, most of Kentucky, and southwestern West Virginia. Mr. MacRae replaces Tom Marshall who has recently moved to Florida.

* * *

PAUL A. EGGLI, JR., has become manager of the Rawlplug Atlanta Co., it was announced by A. J. McEwan, vice-president-sales of The Rawlplug Co., Inc., New Rochelle, N. Y.

Mr. Eggli joined Rawlplug Atlanta in 1949. He succeeds Jack Sutter, who retired recently after 25 years service.

* * *

J. A. "GUS" HENDERSON, 6919 Deanne St., New Orleans 26, La., has been appointed sales representative in Louisiana and the Southern section of Arkansas and Mississippi for Stonco Electric Products Co.

* * *

THE SLATER Electric and Manufacturing Co., Inc., has announced the appointment of The Hodges Co., as direct factory representative for the State of Texas. A complete stock of Slater Lifetime wiring devices and Sta-Kleen plates will be available from The Hodges Company warehouse at 2126 Irving Blvd., Dallas, Texas.

Men Moving Up In the Industry

CLYDE W. SHAW has been elected executive vice president of R T & E Corp., Waukesha, Wis. Mr. Shaw was formerly vice president and treasurer.

Edwin A. Link has been promoted to vice president in charge of engineering of R. T. & E. Mr. Link was formerly chief engineer.

* * *

DON C. LIVINGSTON has been named manager, two-way radio sales, of a 10-state southern area by Motorola Communications & Electronics, Inc.

Livingston had been regional manager in Kansas-Missouri and southern Illinois. He is succeeded in this position by William H. Hawks, formerly a zone manager in Kansas City, Mo.

In his newly created position, Livingston will manage the sale of 2-way radio communications equipment in the area bounded by New Mexico, Oklahoma, Arkansas, Tennessee, and Georgia.

* * *

GEORGE A. FASSNACHT has been appointed manager-duct systems for BullDog Electric Products Co., with headquarters in the Detroit home office.

Fassnacht joined the BullDog sales department in Detroit in 1945. He became field engineer in Columbus, Ohio in 1946 and district manager of the Columbus office in 1949. He was made Chicago district manager in 1952, and midwest regional manager early this year.

* * *

THE APPOINTMENT of James R. Glenn to the position of assistant secretary of Superior Cable Corp., Hickory, N. C. was announced recently by R. Walker Geitner, president of the company.

In addition to his new responsibilities, Mr. Glenn will continue to supervise the inside sales and cost estimating departments. Mr. Glenn has been associated with Superior Cable since the early beginnings of the company.

* * *

DAVID P. MINICHAN has been named assistant manager of the Appalachian Power Company's Bluefield division. Minichan, who is manager of the company's Pulaski, Va., district, is being promoted to the post formerly held by L. W. Bates, now manager of the Bluefield division. The announcement of the change was made in Roanoke by G. L. Furr, vice president and general manager of Appalachian.

A native of Roanoke, Minichan has been associated with Appalachian since 1930, when he was employed as a salesman in Roanoke. He successively held the positions of power engineer, Roanoke district commercial manager, and Roanoke division commercial manager. He was named to the Pulaski district managership in January 1947.

* * *

FRANK J. BABKA has recently been appointed to the post of midwest manager of Sequoia Wire and Cable Co., manufacturers of wire, custom cables, and electronic equipment. Mr. Babka will headquarter at Sequoia's new Midwest offices in St. Louis, Mo. Products to be handled through this new regional facility in St. Louis are wire and cable from Sequoia's headquarter plant in Redwood City, Calif., and missile cable assemblies, cable systems and electronics from Sequoia's Burbank, Calif. Division.

* * *

TWO NEW marketing division appointments have been announced by L. C. Hansen, vice president, marketing of the A. B. Chance Co., Centralia, Mo. Jack Curtright has been appointed assistant to the vice president, marketing and G. Mayne Daly appointed manager, Product Planning Department.

Jack Curtright

G. Mayne Daly

Curtright has been with the A. B. Chance Company for 20 years, most recently as sales manager. In his new position he will work on special marketing and sales assignments.

Daly joined the Chance organization in 1957 after previously serving

as a sales and marketing executive with other electrical manufacturers. As product planning manager, he will supervise the staff of product specialists who recommend new product developments and assist the Chance sales force with technical problems.

* * *

J. H. COLLIER, president of The Steelduct Co., Youngstown, Ohio, producers of rigid steel electrical conduit and electrical metallic tubing, has announced that William F. Zar-

W. F. Zarbaugh

baugh has been appointed vice president-sales of the Steelduct Co. Mr. Collier said that this appointment was the result of the rapid increase in business and expansion of steelduct facilities.

* * *

GEORGE A. TREIBER has been appointed general sales manager of Sargent Electric Corp., 630 Merrick Rd., Lynbrook, L. I., N. Y. Mr. Treiber has been associated with the electrical and electronic industry since 1948 and has been extremely active in association affairs as well as the most recent "First National Conference on Application of Electrical Insulation".

* * *

THE TRANSFER of Robert M. Scott, presently sales manager of Arkansas Power & Light Company's Eastern Division with headquarters at Forrest City, to a similar position in the company's Western Division headquarters has been announced by Western Division Manager Ish Beam.

Scott replaces M. Dale Flake, who last month was promoted to sales manager of AP&L's Little Rock Division.

* * *

DESIGNATION of John Marsh as vice-president in charge of industrial sales is announced by President Frederick Kenner of Ansonia Wire & Cable Co., at Ashton, R. I. Mr. Marsh was formerly Ansonia's market specialist for the power utility industry. In his new capacity, Mr. Marsh will be based at the company's Ashton, R. I., offices.

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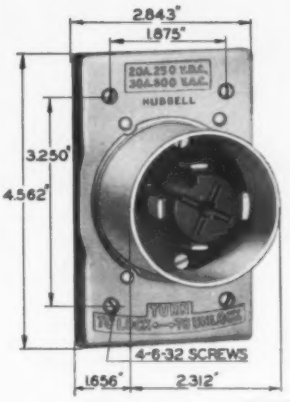
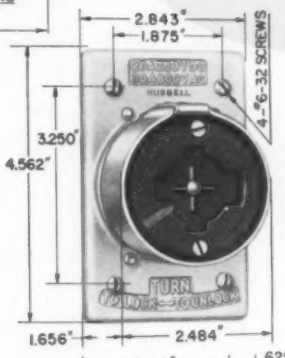
a complete new line of "Hubbellock" devices designed for 4-wire applications requiring additional equipment ground

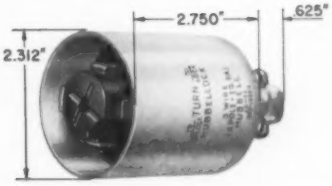


Cat. No. 25418
Male Receptacle with metal housing



Cat. No. 25403
Female Receptacle with metal housing

Cat. No. 25414
Armored Connector Body



Cat. No. 25415
Armored Male Cap

HARVEY HUBBELL, INCORPORATED
BRIDGEPORT 2, CONNECTICUT

WIRING DEVICE OFFICE AND WAREHOUSE LOCATIONS

Bridgeport 2, Connecticut
State and Bostwick Streets

Chicago 7, Illinois
37 South Sangamon Street

Los Angeles 12, California
103 North Santa Fe Avenue

San Francisco, California
1675 Hudson Avenue

IN CANADA:
Scarborough, Ontario,
1160 Birchmount Road

FIVE EXECUTIVE appointments for Holan Corporation and Holan Corporation of Georgia have been announced by President J. Howard Holan.

At Holan Corp., Herman J. Troche has been appointed vice-president and consultant. George H. Eckels replaces him as vice-president-engineering.

Three changes are effective at Holan Corporation of Georgia. Robert R. Rector becomes the vice-president and general manager. O. H. Stelter, Jr., is now vice-president-engineering and manufacturing, and Clifford Booker is secretary and treasurer.

* * *

JOHN A. MCDOUGALL has been appointed vice-president in charge of sales, and C. M. Schultz the new secretary and assistant treasurer of Revere Electric Manufacturing Co., Niles, Ill.

Mr. McDougall joined Revere in 1940 as a lighting engineer. He moved up to aviation lighting sales manager and general sales manager before receiving his current appointment.

Mr. Schultz joined Revere's accounting department in 1941, later advancing to auditor and assistant treasurer.

Dates Ahead

Southeastern Electric Exchange, Annual Conference Boca Raton Hotel & Club, Boca Raton, Fla., March 23-25, 1959.

First Biennial Electrical Industry Show, Hotel Sherman, Chicago, Ill., March 24-26, 1959.

Oklahoma Utilities Association, Annual Convention, Mayo Hotel, Tulsa, Okla., March 26-27, 1959.

International Association of Electrical Inspectors, Virginia Chapter, Charter House Motel-Hotel, Fairfax, Va., March 30-31, 1959.

American Institute of Electrical Engineers, Conference on Electrical Applications in the Textile Industry, Heart-of-Atlanta Motel, Atlanta, Ga., April 2-3, 1959.

Edison Electric Institute, 27th Annual Convention, New Orleans, La., April 6-8, 1959.

International Association of Electrical Inspectors, Ellis Cannady Chapter, Carolina Hotel, Raleigh, N. C., April 7-8, 1959.

American Institute of Electrical Engineers, South East-South Central District Meeting, Dinkler Plaza Hotel, Atlanta, Ga., April 8-10, 1959.

Illuminating Engineering Society, East Central Section, Lord Baltimore Hotel, Baltimore, Md., Apr. 9-10, 1959.

International Association of Electrical Inspectors, Georgia-South Carolina Chapters Joint Meeting, Hotel Richmond, Augusta, Ga., April 12-14, 1959.

Conference for Protective Relay Engineers, A & M College of Texas, College Station, Texas, April 13-15, 1959.

National Electrical Contractors Association, Southwest District Joint Meeting with IBEW, San Antonio, Texas, April 13-16, 1959.

American Institute of Electrical Engineers, Electric Heating Conference, Bellevue-Stratford Hotel, Philadelphia, Pa., April 14-15, 1959.

Missouri Valley Electric Association, Engineering Conference, President Hotel & Municipal Auditorium, Kansas City, Mo., April 15-17, 1959.

International Association of Electrical Inspectors, Alabama Chapter, Jefferson Davis Hotel, Montgomery, Ala., April 16-17, 1959.

Southeastern Electric Exchange, Engineering and Operation Section Meeting, Belleview Biltmore Hotel, Belleair, Fla., April 16-17, 1959.

Illuminating Engineering Society, South Central and Southeastern Joint Meeting, Grove Park Inn, Asheville, N. C., April 23-24, 1959.

Edison Electric Institute, Meter and Service Committee Meeting, Chase Hotel, St. Louis, Mo., April 27-29, 1959.

National Electrical Contractors Association, Southeastern District, Grove Park Inn, Asheville, N. C., May, 1959 (Dates to be announced).

Illuminating Engineering Society, Southwestern Section, Shamrock-Hilton Hotel, Houston, Texas, May 4-5, 1959.

Edison Electric Institute, Transmission and Distribution Committee Meeting, The Shoreham, Washington, D. C., May 7-8, 1959.

International Association of Electrical Inspectors, Florida Chapter, Sarasota Terrace Hotel, Sarasota, Fla., May 8-9, 1959.

International Association of Electrical Inspectors, Five Chapter Joint Meeting (George Welman, Baton Rouge, North-Louisiana-East Texas, Texas, and Texas Gulf Coast Chapters), Carlton Hotel, Tyler, Texas, May 15-16, 1959.

American Institute of Electrical Engineers, Middle Eastern District Meeting, Lord Baltimore Hotel, Baltimore, Md., May 19-21, 1959.

National Association of Electrical Distributors, 51st Annual Convention, Conrad Hilton Hotel, Chicago, Ill., May 24-27, 1959.

American Institute of Electrical Engineers, Summer and Pacific General Meeting, Seattle, Wash., June 22-26, 1959.

Illuminating Engineering Society, National Technical Conference, Mark Hopkins Hotel, San Francisco, Calif., Sept. 7-11, 1959.

Edison Electric Institute, Meter and Service Committee Meeting, Wentworth - by - the - Sea, Portsmouth, N. H., Sept. 14-16, 1959.

Public Utilities Association of the Virginias, Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va., Sept. 17-20, 1959.

Edison Electric Institute, Transmission and Distribution Committee Meeting, Rice Hotel, Houston, Texas, Oct. 1-2, 1959.

International Association of Electrical Inspectors, Southern Section, 31st Annual Meeting, Heidelberg Hotel, Jackson, Miss., Oct. 12-14, 1959.

American Institute of Electrical Engineers, Fall General Meeting, Chicago, Ill., Oct. 12-16, 1959.

AT A RECENT MEETING of the board of directors of the James R. Kearney Corp., F. J. (Jim) Merrill, Jr., was named vice-president, marketing. At the same meeting, James R. Kearney, III, was named vice-president and assistant to the president. W. M. Harlan, Jr., was named a member of the board. Mr. Harlan is president of the Manchester Bank of St. Louis.

F. J. Merrill, Jr.

James R. Kearney, III

* * *

JOHN H. SCHULER has been named vice-president and general manager at Anderson Electric Corp., Birmingham, Ala. In addition Mr. Schuler has been and will continue as secretary and member of Anderson's board of directors. Mr. Schuler s appointment was announced by Thomas H. Fox, president and former general manager. Mr. Fox, who is relinquishing his duties as general manager, will continue as company president.

* * *

J. M. DOHR, formerly manager of the power production department, has been promoted to vice-president in charge of production of Moloney Electric Co. Mr. Dohr replaces C. G. Duenke who has left the company to conduct his own business. Mr. Dohr who has been with the company since 1928, will be responsible for the operation and management of the power, distribution, and electronic transformer production departments.

DOSSON "F" SPLIT BOLT CONNECTOR

Fabricated from high strength alloys (better than average steels), the Dosson "F" is cold-formed for uniform quality. Maximum contact pressure is assured by a high translation of tightening torque. Full length pressure bars with rounded edges prevent load concentration and crushing of conductor. Built to withstand high overload, vibration. Highly corrosion resistant.

Mail coupon for FREE Dosson "F" Connector

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249 Huron St., Brooklyn 22, N. Y.

Gentlemen:
Please rush free sample Dosson "F" Split Bolt Connector plus catalog sheet.

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Exclusive Canadian Distributor:
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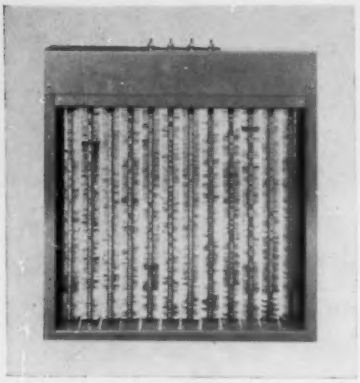
DOSSERT MFG. CORP.
249 Huron St., Brooklyn 22, N. Y.

New products

Forced air duct heaters available in two models

FORCED AIR duct heaters, which provide comfort and warmth in air conditioning systems and have a variety of industrial applications such as air



blasts, ovens, and dryers, have been introduced in a new line by Vulcan Electric Co., 88 Holten St., Danvers, Mass.

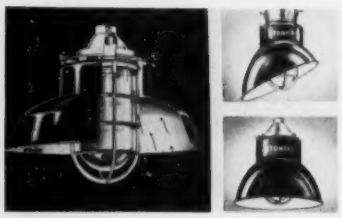
The heaters consist of parallel rows of finned strip elements, mounted in a steel frame. Finned strips offer minimum air resistance.

Two models are available—utilizing either six or three rows of heaters. A wide range of lengths, from 7⅜" to 38⅞" have wattage ratings from 1800 to 20,700. Steel or chromed sheaths are supplied on all models. Thermal controls, for temperature ranges of 60 degrees Fahrenheit to 250 degrees, or 100 to 550 degrees, are optional.

Write P-315 on reply card, page 19.

New vaportight reflector fixtures available

NEW REFLECTORS just introduced by Stonco Electric Products Co., 333 Monroe Ave., Kenilworth, N. J., are available in standard dome, shallow



dome, deep bowl, or angle types up to 200-watts and are designed for interchangeable use with the complete line of cast aluminum pendant, ceiling, or wall Stonco vaportight fixtures.

Built-in vents completely encircle the entire fixture forcing a moving air-stream to flow continually through the reflector and out. This unique "air-conditioning" action helps maintain cooler operation and longer lamp life while sweeping reflectors clean of dust and grime.

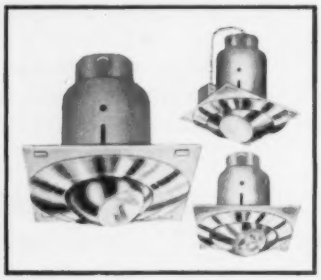
Reflectors are vitreous fired porcelain bonded inside and out to heavy-gauge coated steel in a bright, glazed porcelain enamel finish that will not corrode, scratch, fade, or deteriorate.

Write P-316 on reply card, page 19.

Twist-'N-Turn mounting provides easy installation

TO MEET the needs of many commercial and residential applications requiring concentrated, adjustable lighting, a new 75-watt "Sa'el-Lite" Recessed Eyeball is now being manufactured by Markstone Manufacturing Co., 1531 North Kingsbury, Chicago 22, Ill.

The new unit consists of a precision-formed 5-inch metal sphere, for use with a 75-watt R-30 lamp, and mounted inside a Markstone "T.N.T." Hi-Hat. A swivel and rotating mechanism permits up to 45° vertical



tilt, as well as easy directional adjustment over full 360°.

"T-N-T" (Twist-'N-Turn) mounting of the Markstone Hi-Hat provides fast, easy installation in either new or old work. For use on remodeling or old work, it can be installed by cutting a round hole in the ceiling—no framing-in necessary. Special Markstone construction automatically adjusts itself to any type of thickness of ceiling.

Write P-317 on reply card, page 19.

High-bay lighting fixtures easy to assemble and wire

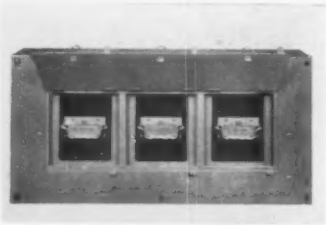
TYPE *MDS* lighting fixtures from Crouse-Hinds Co., Syracuse 1, N. Y., are designed for interior lighting of buildings having high ceilings, such as industrial areas (particularly shops with overhead craneways), armories, and gymnasiums. They are light in weight, highly efficient, and easy to assemble and wire.

These high-bay units are available for 300-1500 watt incandescent or 400-watt mercury lamps. Fixtures may be ordered with separable or single piece head, and with wide angle reflector suitable for low and medium mounting heights, or with concentrating reflector for high mounting and narrow areas.

Write P-318 on reply card, page 19.

Multiple gang units recently announced

THE FRANK ADAM Electric Co., P. O. Box 357, Main P. O., St. Louis 66, Mo., manufacturer of electrical dis-



tribution equipment, has announced a new line of 100 ampere multiple gang units.

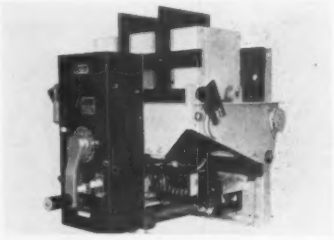
The units are particularly suitable for multi-family use and have 2-pole, 2-fuse and S/N pull-out switches. Available in 2, 3, 4, 5, and 6 gangs.

Individual door over each pull-out has provision for padlocking or sealing. Combination knockouts in top of box over each unit are 1¼-inch, 1¼-inch and 2-inch. Pull-outs are on 7½-inch centers.

Write P-319 on reply card, page 19.

New low voltage power circuit breaker introduced

INTRODUCTION of a new low voltage power circuit breaker, the LA-75A, rated at 75,000 amperes interrupting capacity at 2000 and 3000 amperes current carrying capacity has been



announced by Allis-Chalmers, Milwaukee 1, Wis.

The new breaker provides both electrically and manually charged stored energy closing mechanisms on

at the LOWEST COST YET!

You asked for such a fan — and here it is . . . the new BAR-BROOK BREEZEBUILDER-K, designed with your needs in mind. It's easy to install and operate, presents an attractive appearance and is *lower in price than any other Bar-Brook attic fan ever offered.*

Still, BREEZEBUILDER-K gives you top performance . . . up to 12,500 cfm with only a 1/3 H.P. motor. Comes in three compact sizes, with 30, 36 and 42-inch fan blades. And the attractive aluminum shutter assembly is completely automatic, adds to the decor of any room.

FEATURES

Quiet, rubber-mounted dual ball bearings
Permanent "sealed-in" lubrication
Air deliveries from 7,000 to 12,500 cfm
Rubber-cushioned motor mount
Fan guaranteed 5 years; motor and belt, 1 year

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You'll like doing business with ETP because ETP prices are consistently competitive —ETP fittings are consistently superior. There are no finer made, regardless of price!

CONCRETE TIGHT

One piece, solid tubular steel—cannot open or spread—cannot leak sand or water. Far surpasses U.L. Requirements U.L. File Card E24788.

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EASY ASSEMBLY

Exclusive pre-set, staked screw with deep slotted head for easy working in the tightest areas required. No backing out when inserting conduit.

THESE EXCLUSIVE EXTRAS:

- Tough, sparkly Zinc Chromate over-plating retards corrosion. Salt spray tested.
- Sized for uniformity. U.L. approved.
- Precision bevelled edges with extra heavy duty locknut.
- Heaviest gauge wall thickness with precision rolled thread.
- Available in ½", ¾", 1", 1¼" (one screw type) and 1½" and 2" sizes (two screw type).

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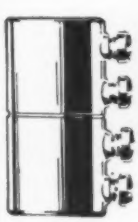
Samples and brochure on request



ETP
ELECTRIC TUBE PRODUCTS

74-16 Grand Avenue, Maspeth (N.Y.C.), N.Y.
DEfender 5-8000

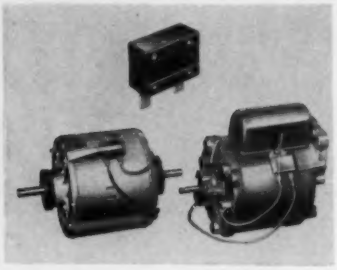
each unit, an exclusive feature in low voltage air circuit breakers.

Positive closing, even under maximum fault conditions, is insured by the Amplitork stored energy closing mechanism. Loss of control voltage during closing, as when closing against a fault, has no effect on the closing ability of this stored energy device.

Write P-320 on reply card, page 19.

Unit attached to motor protects against heating

AN OVERLOAD PROTECTOR for fractional horsepower motors which trips in response to either rising tempera-



ture of the motor or excessive current draw has been introduced by Mechanical Products, Inc. of Jackson, Mich.

The new breaker, known as the MP-1620, is particularly adaptable to the use of fans, disposal systems, air conditioners, refrigerators, freezers, pumps, and other equipment or installations that have fractional horsepower motors. It automatically shuts off current when motor temperatures or current rises dangerously and then restores motor operation when the temperature or current is dropped.

The actuation by temperature of the thermal element in various applications can be precisely varied to open the circuit at any stage of motor temperature or current rise that may be indicated.

Write P-321 on reply card, page 19.

Aluminum rigid conduit available immediately

THE IMMEDIATE availability of aluminum rigid conduit, couplings and 90-degree conduit elbows was announced recently by the Electrical Conductor Division, Kaiser Aluminum & Chemical Corp., 919 N. Michigan Ave., Chicago 11, Ill.

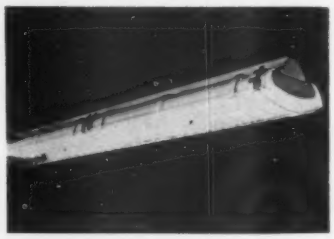
The new products listed by Underwriters Laboratories, meet the same size, shape, and tolerance requirements as those for steel conduit. Nominal diameter sizes for Kaiser Aluminum conduit range from one-half through six inches in standard ten-foot lengths. Larger diameters are available through special order. The conduit is chemically coated inside making wire pulling easier.

Aluminum conduit has many well known advantages in the electrical industry. It is one-third the weight of steel, non-rusting, resistant to corrosion, non-sparking, non-magnetic.

Write P-322 on reply card, page 19.

Gym lights feature industrial-type design

ENGINEERED to withstand exceptional violence and impact, a new approach to gymnasium illumination has been announced by All-Brite



Fluorescent Fixtures, Inc., 352 Shaw Rd., South San Francisco, Calif. The All-Brite series of Gym Lites includes the 96-inch model for two rapid start

L&PDelta Division

INCANDESCENT

Special for March

All the quality, tested performance and economy that have earned Light & Power an enviable reputation in fluorescents are now available in incandescents, through L&P's Delta Incandescent Division.

For instance, check these features of the Delta Adjustable Recessed Eyeball Unit:

1. Made of heavy gauge aluminum
2. Sphere and face plate in brushed satin, and sprayed with heat-resistant lacquer baked to 375° to assure permanent finish
3. Highly attractive unit for accent or display lighting
4. Ideal for Commercial or Residential applications
5. For use with 150 W/R 40 Flood or Spot

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Write today for catalog and price sheets.

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L&P

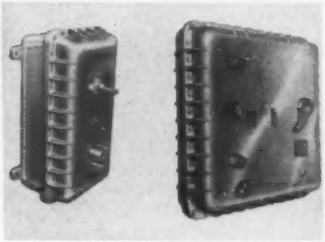
power groove lamps, with porcelain enamel reflectors and featuring extremely high output, No. 88296RS; also a full series of Deluxe RLM models with upward component and finished in porcelain enamel, Series 81, for two or three 48-inch or 96-inch slimline or rapid start lamps.

Power groove and Series 81 models are also available with baked white enamel finish. All models are basically an industrial-type design, ruggedly constructed and fully protected against damage and lamp breakage with a heavy, all-welded mesh guard.

Write P-323 on reply card, page 19.

Motor starter enclosures available in two series

MOTOR STARTER enclosures designed for hazardous locations have been added to their line by Killark Electric Manufacturing Co., Vandeventer and



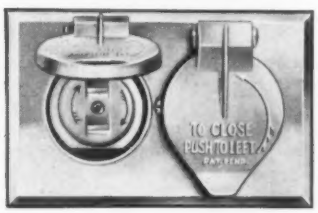
Easton, St. Louis 13, Mo., manufacturers of fittings and fixtures.

Two series are now available: Series XMS, which has been designed to incorporate standard across-the-line starter equipment in all sizes. Series XMCS combination starters are available with all starter sizes and protective equipment. Mounting lugs are provided for easy installation. A variety of other features are also available, such as lock-out arrangements, operating handles, drains and breathers, controls, protective guards for reset buttons, and hinged lids.

Write P-324 on reply card, page 19.

Safety outlets feature outdoor cover plates

BELL ELECTRIC Co., 5735 S. Claremont Ave., Chicago 36, Ill., announces the availability of the "No-Shok"



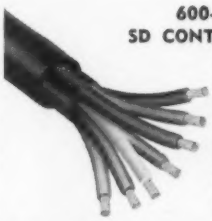
safety electrical outlets in weatherproof outdoor cover plates.

The "No-Shok" outlet has the patented self-rotating receptacle, which closes automatically when not in use.

SUPERIOR POWER and CONTROL CABLES

Insulated and jacketed with modern plastics

600-1000V SD CONTROL CABLE

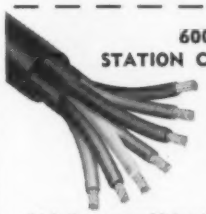


Flexible stranded conductors insulated with polyethylene. Nylon jacket over insulation provides extra protection. Mylar tape over cabled conductors, polyvinyl chloride outer jacket.

POLE & BRACKET CABLE

For use from street lamp base or overhead circuit to lighting fixture. Insulation is polyvinyl chloride, jacket is polyethylene. Operates at relatively low voltage between conductors, high voltage from conductors to ground.

600-1000V STATION CONTROL CABLE

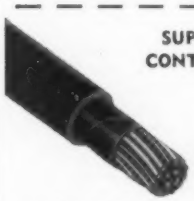


Conductors insulated with polyethylene. S. I. C. rating (2.3%) and Power Factor rating (.0003) remains constant at high frequency. Mylar tape over cabled conductors, polyvinyl chloride jacket overall.

FIGURE 8 POLE & BRACKET CABLE

For 0-600V service. Insulated with polyvinyl chloride. Does not deteriorate with age or weather, resists abrasion and mechanical damage, is not affected by common chemicals nor electrolysis. Will not support combustion.

SUPERVISORY CONTROL CABLE



Conductors polyethylene or polyvinyl chloride insulated. Polyethylene or polyvinyl chloride jacket. With or without shielding. Color-coded to IPCEA specifications or as desired. Composite types with twisted pairs available.

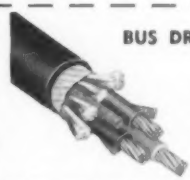
CATHODIC PROTECTION CABLE

Polyethylene insulation with polyvinyl chloride jacket or special polyethylene jacket. Highly resistant to most acids, alkalies and chemicals usually found in corrosive soil areas.

STREET LIGHTING CABLE

Thermoplastic series lighting cables for direct burial, in ducts or overhead. Highly resistant to earth acids and alkalies, moisture, sunlight and weather. With either polyethylene or polyvinyl chloride insulation and either polyethylene or polyvinyl chloride jacket. Shielded types available.

BUS DROP CABLE



Designed especially to provide flexible branch circuit runs between overhead bus feeders to shop and plant equipment. Conductors are color-coded. Insulation and jacket are polyvinyl chloride.

SUPERIOR CABLES are manufactured under a rigid quality control system and are thoroughly tested prior to delivery to assure satisfactory performance.

For complete information and prices, write

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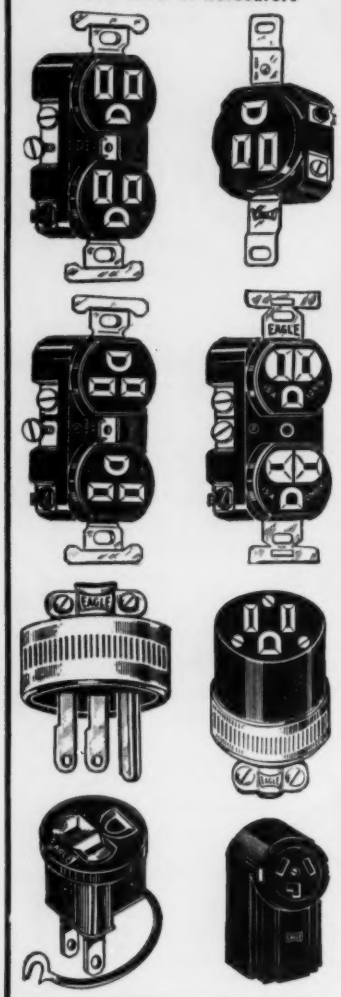

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Be sure to visit the Eagle Booth No. 118 at the Progress in Electrical Equipment Exhibit, St. Louis, Missouri April 7-8-9

"Perfection is not an Accident"

EAGLE ELECTRIC MFG. CO., INC.

LONG ISLAND CITY 1, NEW YORK

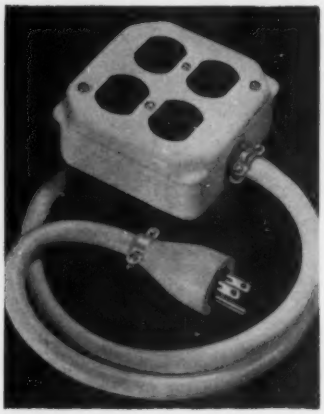
It prevents children from poking metal objects into live electrical contacts. Now, equipped with the Bell Electric Saf-T-Lok outdoor cover plate, the unit is not only childproof, but weatherproof as well.

The "No-Shok" outlet requires only a quarter-turn to insert plug cap for contact, and it snaps shut when the plug is removed.

Write P-325 on reply card, page 19.

Outlet box available for heavy duty use

A NEW outlet box from Ericson Manufacturing Co., 1660 Hayden Ave., Cleveland 12, Ohio, eliminates the need for many long lengths of cord. As many as four power tools, lights,



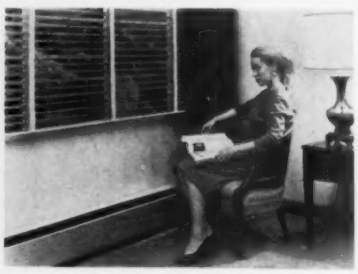
etc., may be plugged in at the point of use. No. 14 cable in 25- or 50-foot lengths is standard, and six different outlet receptacles are available.

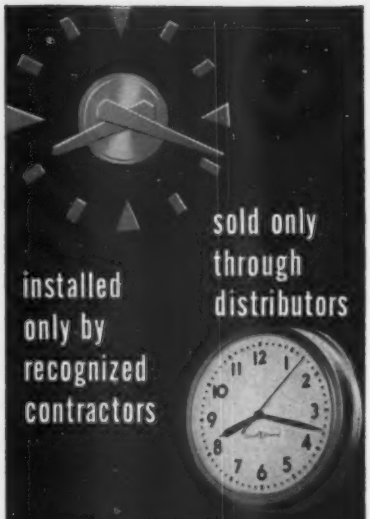
The box is made of metal and is covered with a thick coating of yellow colored Neoprene rubber, which has a high dielectric strength, and is oil- and chemical-resistant. The yellow color is highly visible, attractive, and easy to clean.

Write P-326 on reply card, page 19.

Hot water baseboard electric heat uniform, less costly

HOT-WATER HEATING by thermal circulation of water through hermetically sealed finned tubes, eliminating expensive plumbing and boilers and costly maintenance has been developed by International Oil Burn-





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are industry's first choice

- Edward's Clock Systems are designed for simplicity of installation and minimum maintenance.
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- They require no complicated service or periodic inspection.
- They are accurate! Telechron® motors eliminate scattering, coasting, and need for master clocks.
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Why not call your local Edwards technical representative today and see the help he's ready to provide from initial planning stages through checking-out the completed installation. And while you're at it, see how modern Edwards Fire Protection Systems fit your particular needs.

EDWARDS

Specialists in signaling since 1872

CONTROL • COMMUNICATION • PROTECTION

Edwards Company, Inc., Norwalk, Conn.

(In Canada: Edwards of Canada, Ltd, Owen Sound, Ont.)

er Co., Electric Division, 3800 Park Ave., St. Louis 10, Mo. An advantage which makes this unit attractive to the general buying public is its low cost.

Like ordinary hot-water baseboard heating, but without the pipe connections, the International unit is a slender casing installed beneath the window. It has just a simple electric connection with a thermostat in each room.

The unit itself consists of a copper tube into which an electrical jacketed heating element is inserted and completely immersed in the water so that when the water is heated by the electrical element it circulates up into the finned tube giving off its warmth while being drawn back over the heating element to be reheated in a continuous cycle.

Write P-327 on reply card, page 19.

Flat lamps print out letters, numerals, symbols

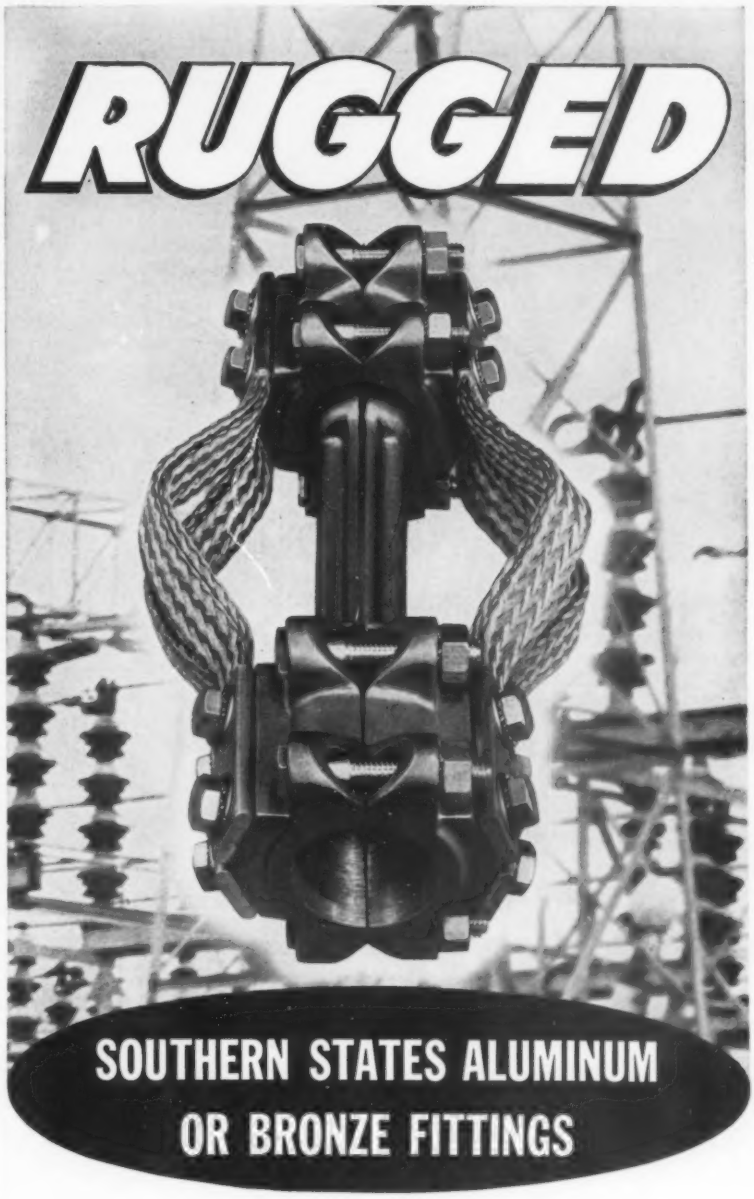
A NEW METHOD for the display of numerical and verbal information has resulted from research in electroluminescence at the lamp division and research laboratories of the Westinghouse Electric Corp., Box 2278, Pittsburgh 30, Pa.

Central to the development are plug-in electroluminescent readout lamps — thin, flat, light-emitting

plates about the size of playing cards —which display all numerals from 0 through 9, all letters of the alphabet, and selected symbols. The new lamps require almost no power input—actually less than 0.2 watts for the largest lamp—and are rated for use on 240 or 460 volts, and 60 to 400 cycles.

Westinghouse lamp division's Rayescent lamp department expects that military and civilian applications will be as "scale-and-pointer" applications for measurement and instrumentation, or as information display boards similar to those found in stock exchanges, air and rail terminals.

Write P-328 on reply card, page 19.



Extra ruggedness at critical stress points receives special attention in the design of Southern States connectors. Ears and walls are husky enough to take the full squeeze of clamping bolts without visible distortion. This extra ruggedness, without excessive bulkiness or weight, is made possible by careful engineering design — backed by more than 25 years experience in producing connectors. *Never underestimate the importance of a good connection!*

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

New low voltage power protector

A NEW LOW voltage power protector for heavy-duty service entrance protection and switching has been announced by General Electric's Low

Voltage Switchgear Dept., Schenectady 5, N. Y.

Designated Type LB-1, the new power protector is a fully coordinated device consisting of an interrupter switch and General Eelctric type CLF high interrupting capacity current limiting fuse.

It is available as a 2-pole or 3-pole unit in 240- and 480-volt ratings with interrupting capacity of 200,000 RMS amperes, and can also be used as a heavy-duty feeder protective and switching device—particularly suited for heavy-duty commercial building applications where power is supplied at 480 volts or below from area or spot networks.

Write P-329 on reply card, page 19.

Pressure latches keep unit weather tight

HOLOPHANE Company, Inc., 342 Madison Ave., New York 17, N. Y., announces No. 440, a heavy-duty outdoor luminaire. The new unit's light

controlling element is a one-piece prismatic refractor made of thermal shock-resisting glass, designed for use with 400 watt mercury vapor or 500 watt incandescent lamps.

The over-all dimensions are 16½" diameter and 15½" in depth. Excellent mechanical holding device supports glass member by means of stainless steel spring hinge; pressure latches securely hold refractor assembly against gasketed hood keeping interior of unit weather tight and free of dirt.

Luminaire can be installed on cast aluminum bracket No. 0877 or standard pole bracket arm.

Write P-330 on reply card, page 19.

New kit fitted to meet emergencies

A NEW KIT, fitted to meet emergency or last minute custom-built liquid-tight wiring needs, is being offered by Appleton Electric Co., 1701

Wellington Ave., Chicago 13, Ill. The kit, called the JIC-100, is both economical and time-saving and contains all necessary fittings to make ½-inch or ¾-inch junction, switch, or receptacle Unilets on the job.

The kit eliminates those expensive and unexpected dashes to a wholesaler for missing parts needed to complete a wiring job. The contents of the JIC-100 emergency kit include: five JIC-B (blank) boxes, five JIC-C (blank) covers, ten HUB-50 (½-inch) hubs, and ten HUB-75 (¾-inch) hubs. Everything necessary for quick liquid-tight wiring connections is included.

Write P-331 on reply card, page 19.

Time switch handles heavy duty applications

A NEW LINE of heavy duty time switches, designed for high amperage loads, has recently been introduced by International Register Co., 2624 W. Washington Blvd., Chicago 12, Ill. Known as the Intermatic "Fifty-Five" Series T500-R time switches, they are recommended for controlling store window lighting, neon signs, electric spectaculars, poster panels, and night lighting of used car lots, factories, parking lots, and garages.

Available in 125 or 250 volt models,

NOW—AN ENTIRELY NEW CONCEPT IN

watertight

service entrance

connectors

THIS exclusive M&W fitting introduces a new high in simplified installation. The hex-nut casting compresses the neoprene gland *directly into the hub* of the meter socket. This permits a faster, easier installation. The conical metal sleeve gives ample take-up around the cable, prevents cable-twisting, and makes a more adequate seal with neater appearance.

New HNS-23 M&W Connectors save time, cut costs, provide ONE connector to handle ALL sizes of 100-amp rated cable. Write today for sample fitting, prices and details.

Non-Water-Tight Connectors — Ground Clamps — Service Entrance Mast Kits — Service Entrance Caps, Straps and Sill Plates — BX and Romex Connectors

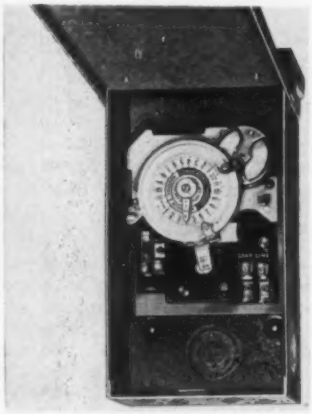
Patent Applied For

EXPLODED VIEW
shows hex-nut casting which compresses into threaded meter hub.

INSTALLED VIEW
A neater, water-tight seal at lower cost.

M&W Electrical Fittings
The M. & W. ELECTRIC MFG. CO., Inc.
EAST PALESTINE, OHIO

the Series T500-R switches are rated at 55 amps per pole. They will handle up to 27,500 watts of tungsten filament (incandescent) lamp loads, or motor loads up to 2 hp. Up to 12



"on-off" operations a day can be obtained by use of easily attached trippers. Oversize Allov-T contacts carry surge loads more than 8 times the normal amperage rating without pitting or welding. Solderless terminal lugs of pure electrolytic copper insure 100 per cent conductivity.

Write P-332 on reply card, page 19.

Outdoor lanterns fitted with convenience outlets

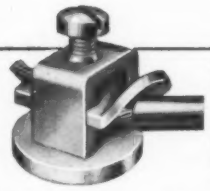
To SOLVE the problem of electrical outlets outside the home, Progress Manufacturing Co., Castor Ave. and Tulip St., Philadelphia, Pa., has fitted their outdoor posts and lanterns with convenience outlets.

Available in a combination of 13 lanterns in traditional or contemporary designs and two styles of posts

in natural aluminum and satin black, the UL listed convenience outlet is protected from rain by a weatherproof cover. The post and lanterns in addition to this new added practical use also lend a touch of distinction and provide a wealth of hospitable light for the outside of the home.

Write P-333 on reply card, page 19.

NOW... WIRE RANGES and DRYERS *Faster*



Heavy duty screw staked to clamping pad for quick, positive action of the pad either up or down —

Shipped with screws backed out, ready for instant wiring; just insert the conductor and tighten the screw!

EASIER, FASTER, SAFER WIRING!

Surface Mounting	Flush Mounting
Black or Ivory	Brown or Ivory
RANGE: Cat. No. 606 50 Amp-250V	RANGE: Cat. No. 610 50 Amp-250V
DRYER: Cat. No. 607 30 Amp-250V	DRYER: Cat. No. 611 30 Amp-250V
Unit Pack: 1	Unit Pack: 1
Ship. Carton: 10	Ship. Carton: 10

Deluxe Chrome Wall Plates
Cat. No. 316 grounding
Cat. No. 317 non-grounding
Fit standard 2-gang boxes in individual envelopes, 10 to a carton, 50 to a shipping carton

You save time and trouble on every installation when you use Royal Range and Dryer Receptacles with the exclusive "Vise-Grip" terminals. "Vise-Grip" assures positive connections every time . . . for FULL, NO-ARC power to the appliance.

No receptacles can "out-feature" Royal — with heavy duty, double-wipe spring contacts, sturdy phenolic body, and self-finding slots. Want details? Ask your wholesaler, or write for catalog, giving wholesaler's name.

ROYAL ELECTRIC CORPORATION
PAWTUCKET, RHODE ISLAND

ROYAL ELECTRIC ...an associate of UL

Technical books

for the electrical man

Maintenance practices

"Maintenance Hints," Revised Edition, published by Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa., 650 pages, $2.00.

This 5 x 7-inch leatherette-bound manual is designed to provide a quick, complete, and convenient guide to modern maintenance practices on all types of electrical equipment.

The handbook is divided into two sections. The first 17 chapters cover specific apparatus maintenance; the last seven cover general maintenance of materials used in apparatus, such as insulation.

All chapters in the revised manual have been extensively updated and revised. In particular, the new edition contains a chapter on maintenance of static controls—the first information ever published in a general handbook. The chapters on electronics and electric brakes have been considerably altered and enlarged.

Throughout the manual, every effort has been made to provide complete information while keeping it general in nature to apply to all types and makes of electrical equipment.

Technician's handbook

"CBS-Hytron Technician's Handbook for 1959." Published by CBS-Hytron, Parker St., Newburyport, Mass., 550 pages, $1.50.

The CBS - Hytron Technician's Handbook for 1959, just announced is filled with up-to-the-minute information on electron tubes and semiconductors.

It features over 1,000 receiving tubes and 330 picture tubes as well as data on transistors, crystal diodes, and special-purpose tubes.

Experience has proved that this is the style of handbook most wanted by service-technicians for on-the-job use. Its pages lie flat for handy bench reference, styling is clean-cut and modern for quick, easy reading, and it is designed throughout to withstand rough treatment.

This complete handbook is available for immediate delivery through CBS-Hytron distributors or from CBS-Hytron Advertising Service.

Sweep generator

"101 Ways to Use Your Generator," by Robert G. Middleton. Published by Howard W. Sams & Co., Inc., 2201 E. 46th St., Indianapolis 6, Ind., 144 pages, 5½" x 8½", $2.00.

Here is an extremely practical guide to the multiple applications possible with a sweep generator. Methods and procedures are covered concisely; for example, the additional equipment required, connections needed, test procedures, and the evaluation of test results. Precautions and supplemental information are included as special notes.

Specific coverage includes 15 uses of the sweep generator in checking and calibrating test equipment, 10 uses in antenna measurements, 15 uses in RF alignment and measurements, 17 uses in IF alignment and measurements, 10 uses in video frequency tests, 10 uses in sound alignment and measurements, and 24 uses in special tests associated with color receivers.

Complete index and table of contents make it easy for the reader to readily locate any specific use for which he is looking. The book contains over 250 illustrations, waveforms, and diagrams. It is sold throughout the country by electronics parts distributors or is available from Howard W. Sams & Co., Inc.

Oscilloscope

"Know Your Oscilloscope," by Paul C. Smith. Published by Howard W. Sams & Co., Inc., 2201 E. 46th St., Indianapolis 6, Ind., 160 pages, 5½" x 8½", $2.00.

This book contains the very latest information on this versatile and valuable test instrument. Time-saving tips, new ideas and methods, and quick reference bring to the reader a more complete understanding of the oscilloscope and its practical applications.

Twelve chapters cover: general information, power supplies, sweep systems, synchronization, amplifiers, special features, accessories, adjusting and servicing the oscilloscope, frequency and phase measurements, amplifier testing with square waves and sweep signals, radio and TV alignment, and practical applications and servicing procedures.

"Know Your Oscilloscope" is sold through electronic parts distributors throughout the country, or is available from Howard W. Sams & Co., Inc.

Latrobé PRODUCTS

FLOOR BOXES • WIRING SPECIALTIES

New # 190 Series

TRU-LEVEL FLOOR BOX

Fullman's new No. 190 Tru-Level adjustable watertight Floor Box is a sheet steel, galvanized octagon box developed for concrete or tile floors, also wooden floors with concrete base.

It is 2½" deep with two ½" and two ¾" KO's in sides—with three ½" and two ¾" KO's in bottom.

A ½" threaded adjusting-ring and three screw legs make for quick and easy tru-leveling. A rubber collar protects the adjusting ring threads.

For up thru 30 AMP — 250 Volt

3 Wire Twist Lock

PRODUCTS

Floor Boxes • Cover Plates
Pipe or Conduit Hangers
Gang Boxes • Junction Boxes
Nozzles • Fish Wire
Cable Supports
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Staples and Cable Clips

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2516 Eighth Court North, Birmingham, Ala.
301 East 10th Ave., Hialeah, Fla.

F. P. WALTER COMPANY
4030 Chouteau Ave., St. Louis 10, Mo.

JIM ROBERTSON & COMPANY
2104 Irving Blvd., Dallas, Texas
1901 Commerce St., Houston, Texas

FULLMAN MANUFACTURING CO.

LATROBE . . . PENNSYLVANIA

Helpful literature

Construction and design features of 4.16-kv horizontal drawout **metal-clad switchgear** with "Ruptair" circuit breaker are described in a new bulletin released by **Allis-Chalmers,** Milwaukee 1, Wis.
Write B-334 on reply card, page 19.

Safety plus variety in a complete line of explosion-proof and non-explosion-proof **fixtures for hospitals** are featured in a new 12-page, 3-color catalog of hospital equipment, from **Appleton Electric Co.,** 1701 Wellington Ave., Chicago 13, Ill. Illustrated and full of dimensional drawings and technical data, Appleton's catalog has been designed for the engineer.
Write B-335 on reply card, page 19.

A new, 8-page, comprehensive catalog listing 200 models of **toggle and trigger switches** is announced by **Sargent Electric Corp.,** 630 Merrick Rd., Lynbrook, N. Y. Ten of the most popular switch series are treated in detail with dimensional outlines, illustrations, electrical and mechanical specifications, and applications.
Write B-336 on reply card, page 19.

The new 50-page pictorial price list catalog from **Leadlight Fixture Co.,** 800 100th Ave., Oakland, Calif., has a new format which is indexed for easy reference to Leadlight's line of **lighting fixtures and electrical accessories.** The catalogs come in three editions: triple column of prices for distributors, double column of prices for contractors, and single column of prices for users.
Write B-337 on reply card, page 19.

A new bulletin describing in detail its line of 4160-volt **metal-clad switchgear** has been published by **I-T-E Circuit Breaker Co.,** 1900 Hamilton St., Philadelphia 30, Pa.

The bulletin covers the complete line of indoor, and standard and walk-in outdoor type equipment with ratings through 3000 amperes continuous-current and 350-mva interrupting capacities. New I-T-E outdoor walk-in switchgear is described in a separate bulletin section.

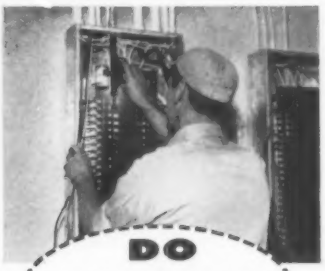
The two-color, 24-page bulletin is illustrated with photographs, sketches, diagrams, and drawings and includes charts and tables for detailed listings.
Write B-338 on reply card, page 19.

Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa., offers a new bulletin F-1613 that illustrates its line of Chromalox **electric strip heaters.**

Thirty-two illustrations show how this type of heater is used across industry for four general purposes: to

Handle HOT jobs the SAFE way!

DON'T
use a steel fish tape and spend many dangerous hours snaking it through a conduit.



DO
use a Jet Line Gun and safely jet-propel a nylon line through the conduit in seconds!

NOTHING BEATS
THE *Jet Line Gun*
For SAFETY and SPEED!

The Jet Line System is SAFE!
- No powder charge
- No explosion
- Both nylon line and polyethylene rope are non-conductors.

The Jet Line System
SAVES WIRE!
SAVES MONEY!
SAVES TIME!

Invented by experienced electricians . . . in use by thousands of contractors!

Do away with danger!

There's no need to worry about hot panels when you use a Jet Line Gun . . . because the need for fish tape and snaking is eliminated!

A small jet-propelled cartridge does the trick! Launched by the Jet Line Gun, in seconds it twists around ells and bends, up and down as it lays a nylon line in the conduit . . . draw polyethylene rope through and you're ready to pull wire in minutes, not hours . . . *safely!*

Ask your distributor or write

Pat. Pending on Method and Apparatus

Jet Line Gun Company
730 Seigle Ave., Charlotte, N. C.

3759

Copyright 1958 Jet Line Gun Co.

LATEST EDITION

ELECTRICAL
ESTIMATING GUIDE

Covers Over 2000 Wiring Jobs

This new, entirely different estimating guide has 175 completely worked out charts.

Authentic, Time Saving—Easy to Use

This book is easy to use—it has no complicated mathematics or formulas to work over. You merely determine the nature of the wiring, check it in the BLUE BOOK OF ELECTRICAL ESTIMATING and there's your answer—it's the simplest estimating book ever written.

ESTIMATING WORK SHEETS
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For a limited time the publishers offer a supply of estimating work sheets (enough for 10 bids) FREE for just examining the new Blue Book of Electrical Estimating. This book was written by a successful electrical contractor and estimating engineer with over 20 years' experience. It has an entirely different method of determining estimates on wiring jobs. Electrical contractors, journeymen, architects, and engineers will find use for this book every day. Gives time required to do jobs along with complete labor charges in every state in the country. Check the PRODUCTIVITY of your men with this authentic, field tested book. Order this book now from your supplier at special introductory price of $8.75, or send coupon below.

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☐ I enclose $8.75 to save shipping cost.

☐ Send C.O.D. I'll pay postman $8.75 plus C.O.D. fee on delivery.

(March 1959)

keep viscous and heavy compounds moving smoothly; for ovens and special-purpose air heating; for tanks, kettles, drums, etc.; and for new or converted platens and other production equipment.

Presentation of typical examples for each of the general purposes includes examples of applications of both straight and curved elements to a wide range of equipment sizes and shapes.

Write B-339 on reply card, page 19.

The complete **vaportight lighting fixture** line just announced by **Stonco Electric Products Co.,** Kenilworth, N. J., is described in a new illustrated 12-page catalog. The new catalog includes specifications, dimensional data with outline drawings and application information for all components and assemblies of the entire line of completely interchangeable pendant, ceiling and wall fixtures.

Write B-340 on reply card, page 19.

Cutler-Hammer, Inc., 223 N. 12th St., Milwaukee 1, Wis., announces the publication of a new 15-page booklet describing its Three Star line of **a-c magnetic starters.**

Cutler-Hammer's Three Star line includes a-c magnetic starters in NEMA sizes 0 through 4 for both reversing and non-reversing single phase and squirrel cage motors.

Write B-341 on reply card, page 19.

Underfloor distribution systems for power, telephone, and intercom are described pictorially in a new 8-page bulletin from Spang Chalfant Division of **The National Supply Co.,** 2 Gateway Center, Pittsburgh, Pa. Three types of Spang systems are included—standard underfloor duct for conventional slab construction in commercial buildings, industrial duct with wider ducts for greater wire capacity, and headerduct for coordination with cellular floor construction. The bulletin also covers duct features that simplify installation and wiring, and improve appearance of floor pans and service fittings.

Write B-342 on reply card, page 19.

A new convenient condensed catalog and **trade price schedule** has just been announced by **Steber Manufacturing Co.,** Dept. R-1, Broadview, Ill. This new catalog contains illustrations and brief descriptions of the complete Steber line. New products included are: two new high bay series, 24-inch 1,000-watt mercury floodlights, fluorescent area floodlights, RLM reflectors, and a full range of counter balanced hinged poles.

Write B-343 on reply card, page 19.

A new 12-page guide describing 14 **portable electric tools** plus a list of accessories for the homecraftsman is offered by the **Porter-Cable Machine Co.,** 132 Exchange St., Syracuse, N.

Y. This buying guide includes pictures of tools and their uses with complete specifications and prices for electric saws, sanders, drills, routers, and garden equipment. This handy little booklet gives pointers on what to look for in purchasing power tools. These tips are given for each type of tool in sections titled: "What to Look for in An Electric Hand Saw" or "How to Tell a Good Router," "Look for These Features in a Standard-Duty Saw."

Write B-344 on reply card, page 19.

A new catalog on wall plates and **wiring devices** has been announced by **Sierra Electric Corp.,** 15100 South Figueroa St., Box 85, Gardena, Calif. It has 144 pages and is divided into 11 sections. A thumb indexing permits rapid selection of any of these sections which cover a wide variety of subject matter, including: special services, accessories, dimensional drawings, and codes and standards. More than 3,500 different product items are listed, priced, illustrated, and cross-indexed.

Write B-345 on reply card, page 19.

The Remcon Division of the **Pyramid Instrument Corp.,** 630 Merrick Rd., Lynbrook, N. Y., has announced the release of the new, revised, pocket-sized Electrician's Manual #RM-605. This 22-page, illustrated booklet contains complete information on their entire line of **remote-control wiring** devices.

Write B-346 on reply card, page 19.

A new four-page folder, with information on the highlights of the Smithcraft **fluorescent lighting** equipment line, is now available from **Smithcraft Lighting,** Chelsea 50, Mass. The new "pony catalog" provides condensed data on Smithcraft commercial and industrial units, recessed troffers, and ceiling systems.

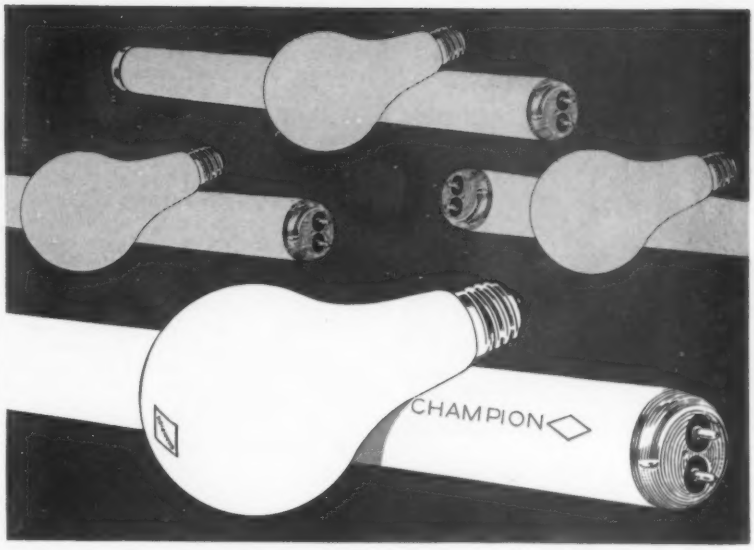
Write B-347 on reply card, page 19.

A unique monthly appointment booklet—desk calendar, that provides a handy reference guide, particularly for engineers, contractors, electrical distributors, and others using or interested in electrical **wires and cables,** has been prepared by Hatfield Wire and Cable Div., **Continental Copper and Steel Industries, Inc.,** 487 Hillside Ave., Hillside 5, N. J.

Write B-348 on reply card, page 19.

Feedrail Corp., 125 Barclay Street, New York 7, N. Y., has issued a 40-page bulletin (No. 60) cataloging their "60" ampere steel-enclosed trolley **busway electrification system.** Included are the new 20-ampere trolleys, an enlarged line of standardized curved track sections and other new items.

The bulletin illustrates and describes the track, trolleys and accessories used in the safe electrification of light tonnage cranes and hoists, as-



of the four major brands of lamps

CHAMPION

stands out for

VALUE

Champion balances

- **LAMP EFFICIENCY**
- **LAMP COST**
- **LAMP LIFE**
- **LUMEN MAINTENANCE**

to give you the most value in

- **POWER COST**
- **LABOR COST**
- **LAMP COST**

which means

- **THE MOST LIGHT FOR YOUR MONEY**

It's the overall cost of light that counts when you're judging value in lamps.

When you buy Champion Lamps, you're buying lowest overall lighting cost because Champion scientifically determines the balance of lamp characteristics that gives the most light for combined power cost, labor cost and lamp cost.

It's because of this balance that, of the four major brands of lamps, Champion stands out for value.

CHAMPION LAMP WORKS
Lynn, Massachusetts

CHAMPION Lamps
Incandescent Fluorescent
Your best buy in lamps

introducing...

THE ALL-NEW

P&S®

ROCKER-GLO

SWITCH

...the switch that looks right, feels right and is right for every type of wiring job.

Here at last! After intensive testing, Pass & Seymour, Inc., proudly presents *ROCKER-GLO* . . . the *one* switch that answers all your needs.

No matter how you choose to operate the new *ROCKER-GLO,* the merest brush of a finger produces instant action . . . *and ROCKER-GLO glows in the dark!*

PUSH IT • ROCK IT ROLL IT • PRESS IT

AVAILABLE in Despard interchangeable type, Despard type mounted on strap and narrow rocker for tumbler switch plates. A specification grade switch, 15 and 20 amps. 120/277 volts A.C.

Send for brochure on Rocker-Glo Dept. ES-359

PASS & SEYMOUR, INC.
Syracuse 9, New York
60 E. 42nd St., New York 17, N. Y.
1440 N. Pulaski Rd., Chicago 51, Ill.
In Canada: Renfrew Electric Ltd., Renfrew, Ont.

sembly and production lines, moving test lines, portable and machine tools, lighting, sewing and cutting rooms, business machines, bowling alleys, etc.

Write B-349 on reply card, page 19.

Lightolier, Inc., Jersey City, N. J., has just issued an eight-page catalog of **popular-priced fixtures.**

Prepared especially for the contractor to use on every day jobs, the new two-color brochure graphically describes a wide range of merchandise for key locations.

Through sharp headlines and quickly-read subheads, the catalog clearly lists sales features and design elements. It suggests specific locations for many of the fixtures illustrated.

Write B-350 on reply card, page 19.

Vapor cooling for transformers is discussed in a new eight-page booklet by **Westinghouse Electric Corp.,** Box 2278, Pittsburgh 30, Pa. Entitled "Vapor Cooling," the publication covers both principles and practice.

Write B-351 on reply card, page 19.

An 8-page catalog on cable and conduit **fasteners and fittings** is now available from **J. J. Walsh Co.,** Greenville, R. I., general sales agent for W. W. Cross and Co. The catalog includes sizes, package information, and price information on a variety of nails, staples, and straps.

Write B-352 on reply card, page 19.

A new Bulletin No. 12 available from **Spring City Electrical Mfg. Co.,** Spring City 25, Pa., includes a complete line of weathertight **conduit expansion fittings** to relieve the strain of expansion and contraction in long runs of conduit. Different types are available in ferrous and non-ferrous metals, for rigid conduit or EMT, and for deflection in addition to expansion and contraction. Illustrations are included to show engineering applications, assembly of units, and typical installations.

Write B-353 on reply card, page 19.

An information sheet on their **transformer hoist** has been made available by **Morrison-Pelsue Co.,** 2256 S. Delaware St., Denver 23, Colo. Specifications and design features are included on the sheet along with photographs of a hoist in operation.

Write B-354 on reply card, page 19.

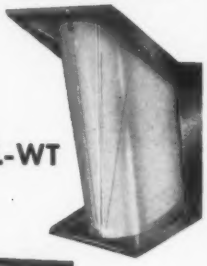
Circuit interruption

(Continued from page 61)

The gas is stored and shipped in standard size steel cylinders, normally holding 100 pounds of SF_6. A 100-pound cylinder contains enough gas to fill a volume of

TEXTURED
BRASS
OR
ALUMINUM
FINISHES
NOW ON
UNION
Non-Metallic
FIXTURES!

Non-Staining
Non-Corrosive



199AL-WT

192BR-WT

168N-AL
U. L. Listed
WRITE FOR CATALOG

UNION INSULATING CO.
PARKERSBURG, WEST VIRGINIA

about 250 cubic feet at one atmosphere of pressure at 75 degrees F. Vapor pressure, which is about 330 psig at 75 degrees F, varies with temperature as shown by the vapor-temperature curve (Fig. 5). Volume varies inversely as absolute pressure.

The cost of SF_6 is approximately $2 per pound, or about 75 cents per cubic foot per atmosphere. In general, the volume of gas required in an SF_6 breaker is considerably less than the volume of oil in a comparable oil-breaker design. For example, the total volume in all three phases of the 1000-mva circuit breaker is only about 15 cubic feet at a pressure of 45 psig, or about 24 pounds of gas.

Filling the circuit breaker

The sealed breaker is usually first evacuated and then filled directly from a high-pressure gas cylinder. Proper filling is determined from the pressure gauge on the breaker. Although a vacuum pump is generally used for removing air prior to filling, high vacuum is not required. The breaker is usually pumped down to a few millimeters Hg pressure; even this degree of vacuum is more than necessary, since an appreciable amount of air can be mixed with SF_6 gas before a noticeable decrease occurs in dielectric strength or interrupting ability.

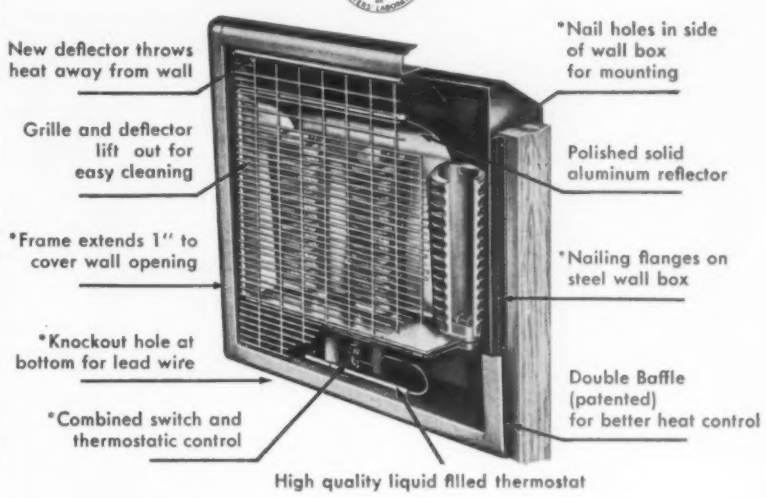
A displacement method can be used for emergency filling on some designs if a vacuum pump is not available. The heavy SF_6 gas can be introduced at the bottom of the breaker tank, and will displace the air, which is exhausted through a port at the top of the chamber. The nonflammable property of SF_6 gas can be used to determine when the air has been completely displaced; by placing a flame before the escaping gas, the flame is extinguished when SF_6 begins to escape.

Any gas loss from a breaker is indicated by a pressure gauge. A simple low-pressure alarm system can also be readily installed. Should leakage occur, gas can be added in most designs even while the breaker is in service, through a filling valve located at ground potential.

Except for some leakage experienced in the early VLB interrupter designs, no leakage problems of any consequence have been encountered. During the first year of service, the 1000-mva, 115-kv breakers lost on an average of less than one pound pressure. This

1st in QUALITY...
FIRST IN FEATURES!

U. L. APPROVED


New deflector throws heat away from wall
Grille and deflector lift out for easy cleaning
*Frame extends 1" to cover wall opening
*Knockout hole at bottom for lead wire
*Combined switch and thermostatic control
*Nail holes in side of wall box for mounting
Polished solid aluminum reflector
*Nailing flanges on steel wall box
Double Baffle (patented) for better heat control
High quality liquid filled thermostat

*Saves time on installation.

Special surface mounting kits available.

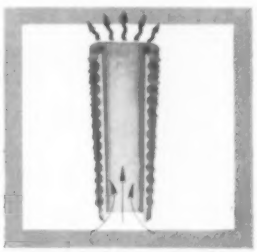
Cavalier
AUTOMATIC ELECTRIC
WALL INSERT
HEATERS

Smart styling plus extra features make Cavaliers easy to sell. The modern, forward-thrust Wall Insert shown is typical of the line. Easily installed, too. You profit from satisfied customers, fewer call-backs. Finest quality throughout. 10 Year Guarantee on heating elements. Complete selection of styles and sizes to give you the inside track on any job.

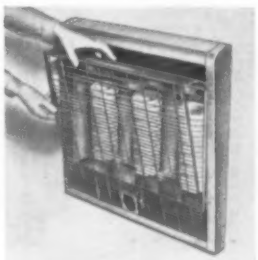
SELL WITH CONFIDENCE
. . . SELL CAVALIER!

Write for catalog and prices on complete line.

Cavalier Corporation
Electric Heating Division
Chattanooga 2, Tenn.
Quality for over 90 Years



EXCLUSIVE
Patented tapered cone construction produces 1/3 more heated air up through element.



EXCLUSIVE
Easy cleaning in 3 minutes or less. No screws or bolts to remove. Grille lifts out, hinged reflector tilts forward.

represents a cost of makeup gas less than one dollar per year per three-phase breaker.

For small interrupters such as the VLB load-break switch, the cost of gas is negligible and is usually not worth saving when a switch is serviced. However, as larger breakers are built, reclaiming used gas becomes desirable. Many systems could be designed for removal and storage of SF_6. The particular system chosen will probably depend upon the breaker design.

If pumps are used to circulate the gas from a low-pressure to a high-pressure chamber, the same pumps can be used to transfer SF_6 into storage chambers at relatively low pressure during servicing.

If the breaker design does not include pumps, a portable system can be designed to pump gas from the breaker into a storage cylinder at a pressure sufficiently above vapor pressure to accomplish transfer in the liquid state.

Servicing breakers

Servicing SF_6 breakers is simple, although a few precautions should be observed. Unarced SF_6 is extremely stable and nontoxic; proper use of activated alumina as an absorber should remove the small amount of gaseous decomposition products formed during arcing.

A breaker being serviced should first be completely evacuated; then the dust-like metallic fluorides should be removed by vacuum cleaning; and finally, the breaker tanks should be wiped with clean rags, and the alumina absorber replaced. Since operating and servicing the SF_6 breaker is different from oil or air breakers, operating personnel should be familiar with the properties and handling procedures of the new medium. However, although the precedures and equipment differ, servicing SF_6 type breakers is no more difficult than most air breakers.

Pole standards

(Continued from page 57)

vertically provides climbing space and supports for transformer reaches and services.

(5) Transformers are mounted on a quadrant of the pole to clear existing secondary wires.

(6) Transformer secondary reaches are used for the dual purpose of feeding the secondary mains and providing space for service taps. Since only compression fittings are used, the main secondary is not cluttered with an excessive number of compression fittings which would be hard to remove if an additional transformer should need to be installed, or if pole changes become necessary.

(7) In congested areas where load justifies a transformer on every pole, the secondary can be removed without disturbing service to customers. The reaches are simply cut loose from the secondary.

(8) The cut-out is mounted on primary arm and angled slightly toward pole to aid lineman in refusing.

Code discussion

(Continued from page 88)

attachment to cabinets or equipment to the grounding electrode, and shall be securely fastened to the ground clamp or fitting. . . "

"This provision of section 2592-a is often violated. Many electricians frequently install raceway or armor over *a part* of the grounding conductor "just for looks" or "for mechanical protection along here where it needs it" without extending the raceway from the service enclosure to the electrode. This forms a reactive "choke" which will prevent the flow of fault current necessary to operate the overcurrent device.

The raceway or armor must be bonded at one end to the water pipe or other electrode and at the other end to the service enclosure, and it must be continuous *all the way*. Some inspectors permit bonding the raceway to the conductor at each end by means of pressure connectors and ground clamps in lieu of connecting the raceway to the ground clamp and to the service enclosure. (See accompanying illustration.)

Equipment grounding conductors of #8 and smaller sizes, if run in the hollow spaces of walls or if otherwise protected, are not required to be run in raceway or armor. As mentioned above, however, such methods of equipment grounding may be used only by special permission.

The three tables in sections 2594 and 2595 list the sizes of

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grounding conductors for a-c systems and equipment. These tables are sometimes misused. The table in section 2594-a lists the required sizes for *common grounding conductors for systems having a grounded neutral.* This conductor grounds both the neutral and all of the connected equipment. The table in section 2594-b lists the required sizes for *common grounding conductors for systems* which are *not* grounded on the premises, such as a 480-volt, 3-phase, 3-wire, *ungrounded* delta-connected system. This conductor grounds all of the connected equipment but not the neutral. In *both* of these tables, the grounding sizes are for the grounding sizes are for *common grounding conductors leading to the ground electrode.* The table in section 2595 lists the required sizes for *individual equipment grounding conductors only on the load side of the service equipment* and *not* for the common grounding conductor leading to the electrode.

Lightning arresters are required to be installed on the line side of connected station loads in each overhead, ungrounded conductor entering or leaving the building in industrial stations where thunderstorms occur frequently unless other means of lightning protection are provided. Arresters installed for utilization equipment may be either inside or outside of the building; but if inside, they must be isolated by elevation or be inclosed. Where the potential between conductors exceeds 750 volts, arresters must not be accessible to unqualified persons.

Answers to Code test questions are as follows: (1. **T** section 2593) (2. **T** section 2597) (3. **F** section 2598) (4. **F** section 2613) (5. **T** section 2621) (6. **a** section 2623-b) (7. **b** section 2623-c) (8. **b** section 2624) (9. **c** section 2624-a) (10. **a** section 2825).

Fixture business

(Continued from page 31)

"But the fixture business requires a lot of time," he admits. "In this business I found that if I was going to take care of my customers in the right manner, I had to have a line of better fixtures. Jobber stocks within easy reach were utterly inadequate. So I visited show rooms all over the country, observing methods of display and selection. As a result I

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have one leading line, in which I try to show every number, and a number of other lines.

"Also, as a result of my travels, I learned that to make the display space pay, fixtures must be crowded. Display space won't pay for itself unless it is crowded."

Cantrell says his sales volume is 70 per cent wholesale. But he says he sells many more fixtures at retail than he did when he displayed only what the nearby jobbers had available.

Cantrell designed and the shop built a lighting control board for the fixture display. Although there are more than 69 fixtures on display, that number can be both lighted and dimmed. Of the displayed fixtures, 23 are controlled by each of three drum switches.

The control board surface is well decorated with typed tags that describe the various fixtures that can be lighted. Cost and selling information are included. New tags may be slipped into the frames provided as fixtures are changed. Each tag is numbered, to correspond with the number on the drum switch of the fixture being lighted.

Exhibition building

(Continued from page 25)

any box in the 108,000 sq. ft. space and quickly provide any service from single-phase, 120-208 volts to 3-phase, 208 volts. If any machinery requires even 36 kw to demonstrate, it can be secured from pillar outlets at the walls, or up to 21 kw at any of the floor boxes, and more from multiple boxes. These panels can be carried and set up by one man, which makes it unnecessary for exhibitors showing model equipment to spend any time or money for special power lines.

There are no long, messy or potentially-dangerous big cables or make-shift rigs. This convenience is expected to promote return visits by many conventions. Also there are adequate power sources in the large private rooms permitting several shows or committees to meet at the same time, and small shows can be handled economically.

There are 138 overhead public-address "speakers" on the main floor. Telephone circuits are provided on the walls with phone terminal boxes every 50 feet for the additional temporary installation of as many as 1,000 instru-

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ments wherever needed. The private rooms have lines and special outlets so that private telephone switchboards may be set up.

There are eight special TV circuits with 100 amp, 3-phase service for lights and power, and also cable connections to pick up and transmit telecasts to local or national hook-ups. Two TV outlets are also provided on the roof. Large outside doors permit sound trucks to drive in on the main floor to transmit events.

Special lighting

A bank of 16 special 1,500-watt lights, affording 200 footcandles, has been permanently installed over the boxing ring space, and 24 1,000-watt units over the basketball space. These units are smoothly integrated into the high-bay pattern and require no preparation for instant use. Thus, different events can be scheduled on short notice or on successive nights without extra expense. The pinpoint control from the booth permits the regular house lights to be put off or on instantly as needed during boxing events to concentrate light on the ring.

There are two large outlets near the 50- by 110-ft. portable stage space, also banks of stage lights which can be quickly raised or lowered as a unit. The steel frame work of the roof provides a space for the raising of the battens on which the stage lights are mounted, so that they seem to disappear when not in use. The private rooms have outlets for portable stage lights and the largest room has a built-in Hi Fi sound system for concerts.

About 100 feet of 3-phase busway was installed to feed the 3,500-amp main switchboard and the 1,200 tons of air conditioning. 21 electrical air-handling units are used to distribute the air over the water-cooled units.

The main switchboard employs large air circuit breakers and also Cordon breakers for extra safety because of the high short-circuit current available, in case of delay in opening.

Electric cooking and food-heating facilities permit catering to 1,500 people at one time, with portable electrically-heated food carts permitting meals to be served in any part of the large building.

High-level smoke vents and relays of directional fans, controlled from the central booth, help clear the air as needed.

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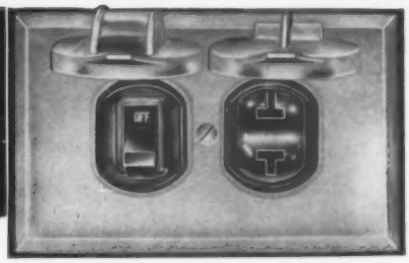

No. 241 COMBINATION SWITCH AND RECEPTACLE

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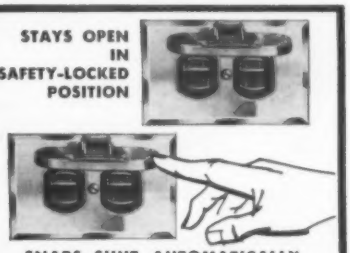
FEATURING *Exclusive* STAY OPEN SNAP-COVER ACTION



No. 219 SINGLE SNAP-COVER PARALLEL SLOT DUPLEX RECEPTACLE

No. 220 SINGLE SNAP-COVER 3-WIRE GROUNDING DUPLEX RECEPTACLE

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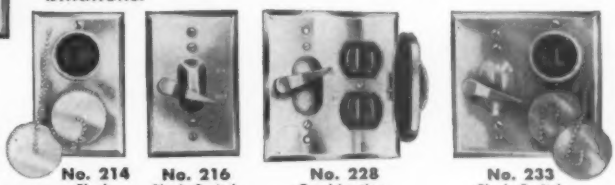

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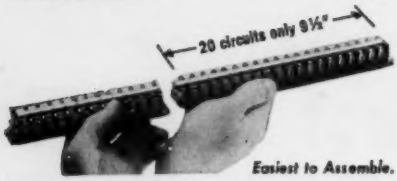
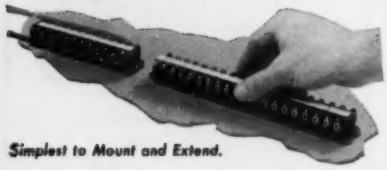


Easiest to Assemble.



Simplest to Mount and Extend.

ANY NUMBER OF CIRCUITS — pre-assembled lengths of 20 snap fit circuits (1-1/8" w. x 63/64" h.). No single pieces to handle, pull off or add circuit groups as needed. Single snap-on end section completes block.

HAND ASSEMBLED without hardware; only 2 parts to handle; use mounting screws only every 12 circuits. Channel mounting also available; integral or separable marking strips.

LARGER CAPACITY IN LESS SPACE—#22 thru #8; conservatively rated at 750 volts. Choice of contacts (7/16" o.c.) for stripped or terminal-ended wires (can be combined in single block).

LENGTHEN IN SERVICE without removing mounting screws or losing contact space.

USE FEWER CIRCUITS by grouping common wires—decrease jumpering; no unused contacts.

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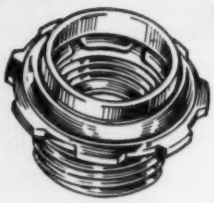

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- OK in concrete slabs—perfect for cramped or corner locations.
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Large outside entrance doors allow the city's regular hydraulic-lift ladder trucks, which serve the municipal street lights, to drive right in and service the high-bay lights. This saved the cost of extra cat walks for maintenance.

Other points of interest were noted by the contractor: (1) There are three 1,000 kva transformers in the vault, with room for three more later. (2) There is an automatic transfer switch between the dual primaries. (3) The 13.2 kv primaries are tied to a common bus, and each transformer has a net-work protector to cut it out in case of failure.

Efficient and steady rolling scaffolds were provided for the high-bay work by using two scaffolds fastened together by pipes with about a scaffold's width of space left between them. In this way 16- by 8-ft. platforms on top made it possible to handle the 300-lb. lobby fixtures and full lengths of electrical metallic tubing on the high bays. Changing the lobby ceiling from the original plastic design to suspended fixtures and acoustic tile saved the city money, but cost the contractor extra to install.

The checker-board pattern in which the main floor slabs were poured made the setting of the in-floor conduit more difficult. Over 26 miles, or two carloads of conduit and tubing were used on the job and 118 miles of wire.

Cable trenches were built under the main switchboards by Whitmore in order to give better access and permit easy maintenance. These were 3 ft. deep and 6 ft. longer than the board to permit a manhole at each end.

The original electrical contract was for $425,000.

St. Louis school

(Continued from page 27)

office, where electric heat is accomplished by a total of 57.5 kw of recessed heaters designed by Chromalox.

Also sharing in Bayless High School's all-electric facilities was the school's kitchen. Here, school administrators found, electrically-operated appliances saved space and steps, cut food costs through elimination of spoilage due to overcooking and uneven heat, and reduced maintenance costs since there are fewer thermostat problems, and no more sooty, grimy

walls to be cleaned.

The designers of the school specified all-electric facilities because it was felt this would provide a better environment for the learning process and because they realized that with the continuing need for expansion, electricity can easily be adapted without major changes to the system already in use.

Careful buying

(Continued from page 29)

wiring for air conditioning in the winter when labor comes at a better rate, and we do not wait till the last minute before cold weather sets in to obtain inside winter jobs. We try to finish this type work in late summer.

In starting a job, we pick the foreman best suited to the job. Often we bid a job with a certain man in mind because of his skill and specialties. At the outset of a job we let our men know how many man-hours have been figured for each phase or increment of a job. Of the 10 increments, there are certain phases which are broken down. As we check through jobs from week to week with the foreman, we learn what percentage of increment has been carried out, whether we are ahead or behind, and what percentage of the job has been completed to date. This means close supervision but lets us know how we stand on a given job at any given time.

Our field superintendent checks with foremen on jobs, discussing easier ways of completing a job, spending more time with jobs that may need him.

Incentive pay plan

Our incentive pay plan for mechanics which awards them a prorated amount for their share in man-hour savings in labor costs plays an important role in the all-round better job that we ultimately turn out.

We keep a close eye on possible savings as we study plans in estimating. If we believe we can redesign electric service, make certain improvements and effect savings, we get in touch with the engineer and put our proposition to him. In one recent case, where it was difficult to get all large conduit into panels where they belonged, and where power panels, mainline circuit breaker and CT cabinet, and a mass of conduit would be on the walls, we redesigned the job.

Using a free-standing cubicle with switchboard, we ran all conduit from the hallway into the cubicle, saving thereby 175 man-hours. The engineer liked our replacement and accepted it.

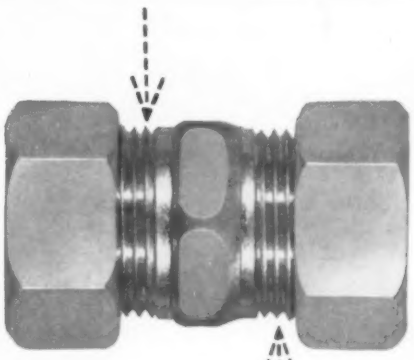
A warehouse can prove profitable. A contractor may raise the question of balancing the costly expense item of rent on a warehouse yet we have found that our $500 monthly rent was a minor item against the vast savings that storage space affords. Our 6000-sq. ft. warehouse permits quantity buying at tremendous savings because we are able to store. Taking advantage of bargains more than makes up for the high rental. We have all material shipped into the warehouse and not directly to a job. We find that broken or damaged materials caught before delivery to a site eliminates the lengthy waiting period of replacement from the supplier. Jobs are finished sooner.

Time-saving equipment

We look upon time-saving equipment as contributing toward our profit picture. We have found a crane a great labor saver in street lighting, parking lot work, and poleline work. Our crane has been used for moving reels of wire weighing 1,000 to 1,500 pounds from the warehouse and for transferring switchgear. At our Andrews Air Base job where breaking loose lead wire installed in a manhole presented a difficult problem, our crane and truck pulled the lead wire out of conduit. When our crane and ton-and-a-half truck are not in use, we rent them at a minimum of $25 for three hours. This and the labor savings have more than paid off our $3,000 investment in crane and truck.

An automatic wire pulling machine has reduced costs of pulling wires on large feeders by more than 50 per cent. On long pulls where many men are needed, labor costs are cut considerably. To cite the Andrews Air Force Base job again, in a series of runs ranging from 180 feet to 325 feet, our automatic wire pulling machine was instrumental in reducing an estimated 425 man-hours to 164.

One of the most important savings to any contractor is the cash discounting of bills. We save $300



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Blackhawk's new EMT fittings are a product of continuing Blackhawk research and automated methods of manufacture. Order a stock today to meet the demand for these quality made, EMT fittings. A complete range of sizes is now available.

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Only Y-ER EAS has all these features

- Creamy, non-corrosive lubricant. Never greasy or messy.
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to $500 per month discounting bills which adds up to thousands of dollars over a year.

There is many a contractor who could improve his buying efficiency. It is important for contractors, especially the smaller ones, to become aware of places at which they can buy for less, not only locally, but out of town. If there is any question about an item, it is advisable to obtain a sample. Samples are gladly furnished by out-of-town suppliers for approval.

There is money to be made by the contractor in smart buying. A contractor need not rely solely on his 10 per cent markup but go after the savings to be found in labor savings devices. Careful coordination of materials buying and delivery also add to this savings.

Foremen responsible

(Continued from page 28)

items as ladders to the nearest post. Ladders and materials can be damaged by falling debris and other heavy materials. Such items are expendable but improper care can run up the cost of the electrical work.

Our electricians are a competent group and are familiar with the tools. When we purchase a special tool for any job, its operation is demonstrated by the distributor. Our employees are careful of these tools. If some apprentice needs instruction in the tool's use, there is a journeyman willing to show him its proper use or instruction is given by the foreman.

Time and labor is saved with the use of the new tools on the market. For instance, on a recent job, we used an electric wire puller to pull a quantity of 500 MCM wire. The men rigged up a remote button and handled the job easily. Without the wire puller, it would have taken five or six men to pull in these circuits. On one job it took four men to pull some temporary lines before we put this machine on the job to pull the permanent lines.

Some small tools are worth their weight in gold. We value very highly the wire cutter, a simple hand tool. Formerly, we had to use a hacksaw to saw the wire. Another handy device with us is an adjustable, ball bearing reel roll. Another is a hydraulic "knock-out" punch, especially valuable in punching holes to size in a switch or panel board. Power

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2-Ton Chevrolet Line Truck, '51 Model, 16,000 Miles, Good Condition, McCabe Body, Garwood Winch, A-Frame. Mt. Pleasant Power System, Mt. Pleasant, Tennessee.

pipe threaders, power benders, and power saws and drills are tools that can be used satisfactorily on any job.

Other tools which we use include plaster groovers, masonry drills, stud drivers, electric grinders, electric test meters, telescopic scaffolding, and rolling scaffolds.

Before putting a new machine in service, our name is stenciled on it. Within the shop, the small tools are mounted on a board "with a place for everything and everything in its place". Good housekeeping in the shop is important in keeping up with the tools.

We expect to lose a number of smaller tools. Keeping such losses to a minimum with necessary tools ready for any job increases the efficiency of any electrical contractor.

We use five times the variety of tools we used ten years ago. Electricians talk about "the good old days" and how "we did it then," but they would not go back to that time. We know the work was more tedious than working with today's machines. We endeavor to keep up with the latest method of doing electrical work. It is imperative to stay competitive and keep up with the march of progress.

Contractors tell how

(Continued from page 36)

and designated as the "Hi-Hoist," this new unit is ruggedly built to lift materials weighing up to 100 pounds. It hoists to a height of 13 feet. The telescoping lift mechanism is controlled by a non-slip, cable drum crank operation. Three wide-spread legs add utmost stability and the entire unit rolls easily on 3-inch casters.

The hoist is completely portable. It disassembles into 3 sections in less than a minute, and can be easily carried from job to job in a pick-up truck or the trunk of a car. The entire unit is constructed of heavy-weight, zinc-coated steel.

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NEW! EXTRUDED ALUMINUM SHUTTERS

With Completely Concealed Pivot Pins

Lightweight . . . Strong . . . Durable

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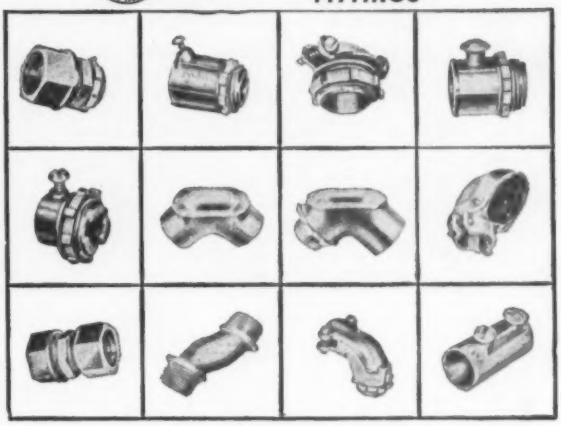

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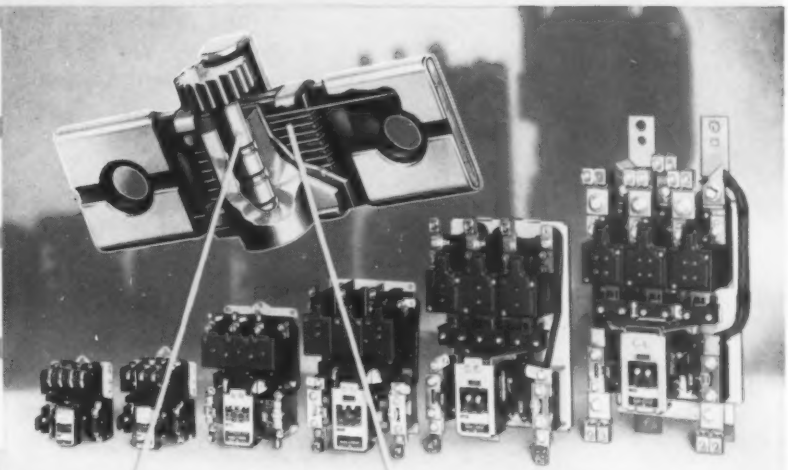

Heat-responsive element (solder pot) provides accurate response to overload, yet prevents nuisance tripping.

Heat-producing element is an integral part of overload unit. It's permanently joined to solder pot, can't become misaligned.

Only ONE-PIECE Overload Relays can give 100% Protection Only with ONE-PIECE construction can you *know* you've installed the heater correctly. Only with ONE-PIECE construction can you *know* the heater is exactly centered, or properly positioned, so that it performs according to its rating. Only with ONE-PIECE construction can you *know* your starters will not operate without the thermal units properly installed. Only with ONE-PIECE construction can you *know* your motors have full protection.

Only Square D has ONE-PIECE Construction ONE-PIECE construction *eliminates* any possibility of heater misalignment. Square D melting alloy thermal overload relays can be installed only one way. They are tamper-proof. They are factory-assembled, are *individually* calibrated and tested. Repeated tripping will not affect their accuracy.

Insist on Square D starters with melting alloy thermal overload relays

LET US PROVE IT!

Let your Square D Field Engineer show you **1** how one-piece construction is accomplished and how easy it is to mismatch separate heaters and solder pots— **2** an endurance tester to prove that overload units can be reset repeatedly without damage while the solder is liquid— **3** a tripping time tester to compare various types of melting alloy units and to prove that tripping time won't change after repeated operation.

Write for Bulletin SM-275 for the complete story on Square D starters with ONE-PIECE thermal overload relays. Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin

SQUARE D COMPANY

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Electrical Contractor: HYBE ELECTRIC CO., Chicago, Illinois

Electrical Protection goes MODERN *with BUSS fuses!* . . . in the MORTON SALT BUILDING Chicago, Ill.

The beautiful, new Morton Salt Building is located at 110 North Wacker Drive in Chicago—just outside the Loop.

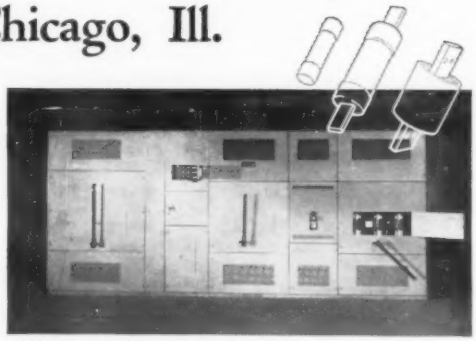
The most modern and safest electrical protection was needed because the engineers estimated the available fault current might easily reach a value of 75,000 amperes.

BUSS Hi-Cap fuses and FUSETRON dual-element fuses were installed because of their high interrupting capacity and proven dependability.

With Fuses, Safe Protection Remains Safe

Dust, fumes, corrosion or age cannot increase a fuse's capacity or lengthen its blowing time. The operation of a fuse is not dependent on latches, triggers or other devices that are subject to strains and jars of mechanical action—both in opening and closing.

A fuse cannot stick or fail to operate when electrical trouble occurs. 1 year, 5 years or 20 years from now, a fuse will provide the same, high degree of protection as on the day it was installed.



Morton Salt Building: The main switchgear, consisting of 1-4000 ampere, 1-2000 ampere and 1-1200 ampere pressure switch, is completely equipped with BUSS Hi-Cap fuses.

To make available the same safe, dependable and trouble-free protection, all distribution panels are equipped with FUSETRON dual-element fuses.

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